THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1981.] LONDON, APRIL 30, 1901. [53RD YEAR. PRICE 6d.

JUST OUT. IMPORTANT NEW WORK. 24s. NET.
With numerous Plates, Diagrams, and Illustrations.

Central Electrical Stations:

THEIR DESIGN, ORGANIZATION, AND MANAGEMENT.

By CHAS. H. WORDINGHAM,

A.K.C., M.Inst.C.E., M.Inst.Mech.E.

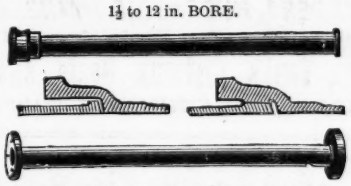
Late Member of Council of the Institute of Electrical Engineers and Electrical Engineer to the City of Manchester.

ABSTRACT OF CONTENTS:—Central Station Work as a Profession.—As an Investment.—Systems of Supply.—Choice of Site.—Architectural Features.—Plant.—Boilers, &c.—Systems of Draught and Waste Heat Economy.—Methods of Firing Boilers.—Coal Handling, Weighing, and Storing.—Feeding Boilers.—The Transmission of Steam.—Generators.—Condensing.—Switching Gear.—Distributing Mains.—Drawing-in Systems.—Built-in Systems.—Insulation, Resistance, and Cost.—Distributing Networks.—Service Mains and Feeders.—Mains.—Recording and Laying Mains.—Standardizing and Testing.—Secondary Batteries.—Street Lighting.—Cost of Production.—Regulations of Consumers' Installations.—General Organization of a Central Station.—The Generating Station.—Mains Department.—Installation Department.—Standardizing Department.—The Drawing Office, Transforming Stations, and Street Lighting.—The Clerical Department, &c., &c.—Index.

LONDON: CHARLES GRIFFIN & CO., LTD., EXETER STREET, STRAND.

GAS AND WATER PIPES

1½ to 12 in. BORE.



THOMAS ALLAN & SONS, LIMITED,

Bonlea Foundry,

THORNABY-ON-TEES.

Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

Also Manufacturers of

SANITARY & RAIN-WATER PIPES, HOT WATER PIPES, STABLE FITTINGS, RANGES, STOVES, And GENERAL CASTINGS.

Telegrams: "BONLEA, THORNABY-ON-TEES."

PARKER & LESTER,

Manufacturers & Contractors.

GAS-LEAK INDICATOR.

For Particulars and Price apply to

ORMSIDE STREET, LONDON, S.E.

ESTABLISHED 1830.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

NORTON'S PATENT

"ABYSSINIAN" & ARTESIAN TUBE WELLS,

FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz.:—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,

HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

EVERYONE IS SAYING.....

"If you want to see the Most Successful Destructor and Electric Light and Traction Installation,

"GO TO DARWEN."

For Full Particulars apply to

MELDRUM BROTHERS, LIMITED,

ATLANTIC WORKS, MANCHESTER;

And 66, VICTORIA STREET, WESTMINSTER, where a complete Model may be seen.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, Ld.

MANUFACTURERS OF PURIFIERS OF ALL SIZES,

With Improved Centre-Valves, to work either One, Two, Three, or Four Purifiers at one time.

SLIDE VALVES.

SCREW VALVES.

SEAL-REGULATING VALVES.

GASHOLDER VALVES.

FOUR-WAY VALVES.

DISC VALVES.

SELF-ACTING BYE-PASS VALVES.

COMPENSATING VALVES.

UNSOLICITED TESTIMONIAL.

"March 3, 1899."

"Some years ago you made an"
"18-inch double covered valve for"
"Purifiers delivered to our Works."
"We are likely to want another"
"for this Station; how soon could"
"you supply it, and what would"
"the price be delivered here? The"
"first one which you made for me,"
"above 30 years ago, is still"
"in excellent working"
"order."

Hand-Power LIFTS, suitable for weights up to 10 Tons.

Hydraulic Power GOLIATHS, suitable for any Weights.

Improved WOOD GRIDS for Purifiers and Scrubbers.

SPECIFICATIONS AND PRICES ON APPLICATION TO—

THE IRON-WORKS, FROME, SOMERSET.

Telegrams: "COCKEYS, FROME." London Agents: Messrs. BALE & HARDY, Bridge House, 181, Queen Victoria St., E.C. Telegrams: "DAMPER, LONDON."

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—

MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

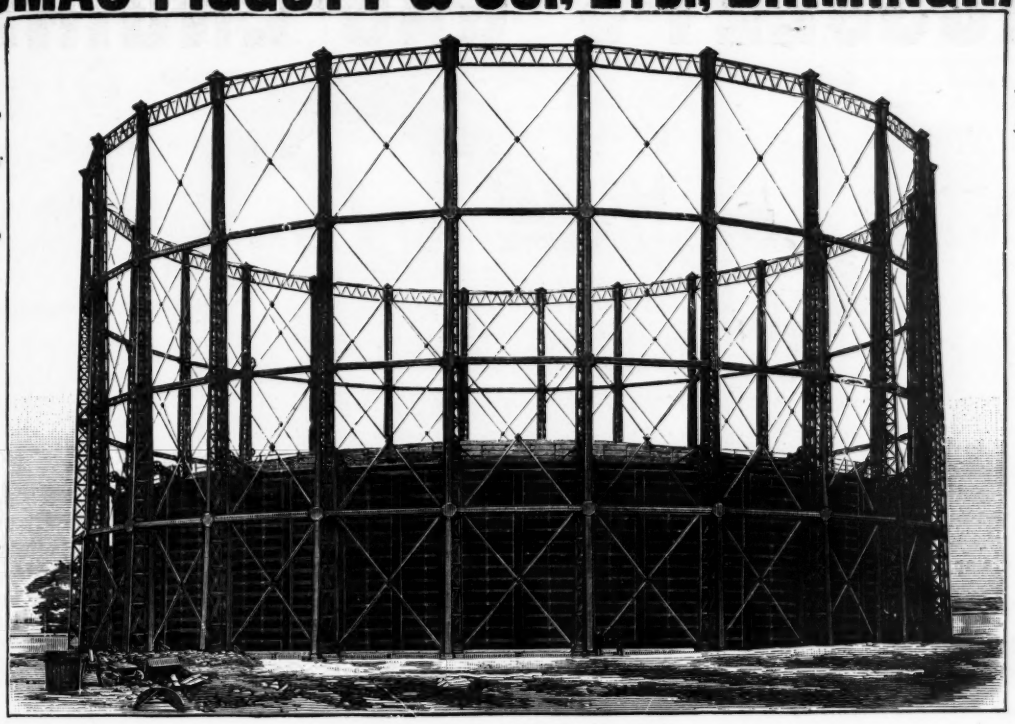
SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

LONDON: 108, Southwark Street. MANCHESTER: 33, King Street West. BIRMINGHAM: 114, Colmore Row. LEEDS: 6, Mark Lane, New Briggate.

THOMAS PIGGOTT & CO., LTD., BIRMINGHAM.

LONDON OFFICE: ST. THOMAS APOSTLE, E.C.

GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM

WELDED & RIVETED PIPES, FOUL MAINS, RETORT LIDS, WROT & CAST TANKS, PURIFIERS.

MANUFACTURERS OF

Humphreys & Glasgow's Patent Carburetted Water-Gas Plant.

INSTALLATIONS HAVE ALREADY BEEN SUPPLIED, AND ARE IN HAND FOR THE FOLLOWING GAS-WORKS:—

COPENHAGEN
BELFAST
BRUSSELS
LIVERPOOL
TOTTENHAM
SWANSEA
MANCHESTER
BRIGHTON
PRESTON
SOUTHPORT
BATH
HOYLAKE
COVENTRY
WINCHESTER
SHANGHAI
STOCKPORT
NORWICH
LEA BRIDGE
DUNEDIN (N.Z.)
HULL
STAINES
EDINBURGH
GOSPORT
STAFFORD
STOCKTON-ON-TEES
TUNBRIDGE WELLS
GUILDFORD
COMMERCIAL GAS CO.
BRIDLINGTON
MIDDLESBROUGH
CROYDON
L. & N.W. RY., CREWE
TAUNTON
ROTTERDAM
DORKING
G.L.&C. CO., BROMLEY
DURHAM
SCARBOROUGH
PERTH (W.A.)
BREMEN
LINCOLN
LONGTON
COLNEY HATCH
SYDNEY (Harbour)
SYDNEY (Mortlake)
ANTWERP
BIRMINGHAM
HEBDEN BRIDGE
MAIDENHEAD
EPSOM
NORTH MIDDLESEX
WANDSWORTH
AARHUS
FALMOUTH
SOUTHAMPTON
HARTLEPOOL
UTRECHT
DEVENTER
PORTSMOUTH
BOURNEMOUTH
AYLESBURY
HAMBURG
DUBLIN
REDHILL
FAVERSHAM
CHORLEY
LIÉGE
BRENTFORD
WALTHAM
THE HAGUE

REPEATED CONTRACTS.

TOTTENHAM (2nd)
TOTTENHAM (3rd)
TOTTENHAM (4th)
COPENHAGEN
BELFAST
BRUSSELS (2nd)
BRUSSELS (3rd)
BRUSSELS (4th)
LIVERPOOL
COVENTRY
LEA BRIDGE
MAIDENHEAD
COMMERCIAL (2nd)
COMMERCIAL (3rd)
COMMERCIAL (4th)
G.L. & C. CO., NINE ELMS
G.L. & C. CO., BECKTON
G.L.&C. CO., BECKTON (2nd)
G.L. & C. CO., FULHAM
BRIGHTON
STOCKPORT
CROYDON
MANCHESTER
DUBLIN
SOUTHAMPTON
BRIDLINGTON
SWANSEA (2nd)

ASTON TUBE WORKS, LTD.,

BIRMINGHAM.

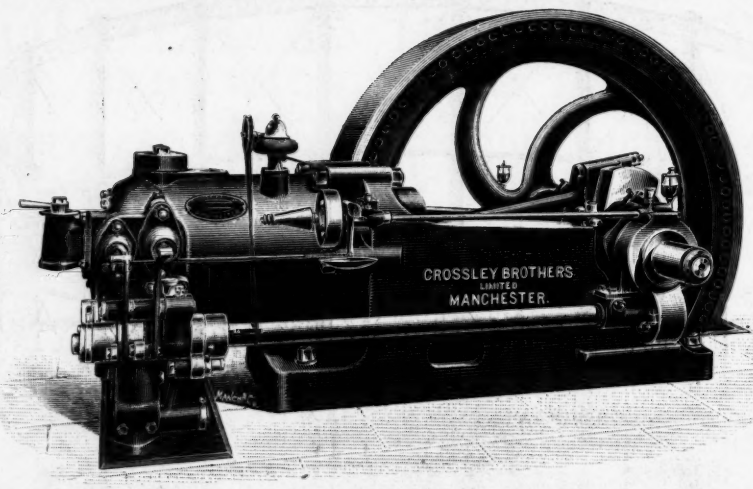
Telegrams: "PLUME." *London: "DEPLUME."*

London Office:
146, DASHWOOD HOUSE, 9, NEW BROAD ST., E.C.

MANUFACTURERS OF ALL KINDS OF

WROUGHT-IRON TUBES AND FITTINGS.

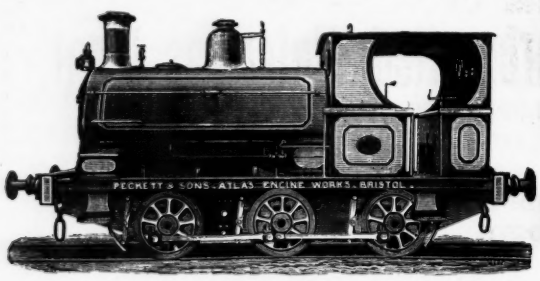
CROSSLEY'S GAS-ENGINES



Represents approximately U.E. Type to Z.C.E. Type High-Speed Electric Light Engines of 40 to 150 Effective Horse Power.

Large Number of Second-Hand Engines always in Stock.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for Immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

Telegraphic Address: "PECKETT BRISTOL."

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: **19, Great George Street, WESTMINSTER.**

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS, IRONFOUNDERS, & CONTRACTORS.

Manufacturers of every description of

PLANT, APPARATUS, and MACHINERY for GAS and CHEMICAL WORKS.

RETORTS and FITTINGS, MOUTHPIECES with Self-Sealing Lids.

Improved COAL and COKE HANDLING PLANT, CONVEYORS, and ELEVATORS,

CONDENSERS, SCRUBBERS, and WASHERS.

PURIFIERS with Planed Joints a Speciality.

Patent CENTRE-VALVES, RACK and SCREW VALVES, WOOD GRIDS, and SCRUBBER-BOARDS, CAST-IRON MAINS, and SPECIALS.

STRUCTURAL WORK, COLUMNS, GIRDERS, and ROOFING.

GASHOLDERS, Cast-Iron or Steel Tanks.

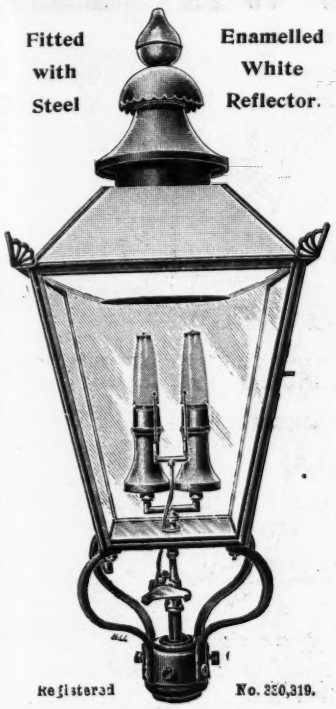
DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

PIG IRON (Special Quality) for Engine Cylinders. GAS COAL famous for its UNRIVALLED EXCELLENCE

THE
"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



Registered No. 230,319.

The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

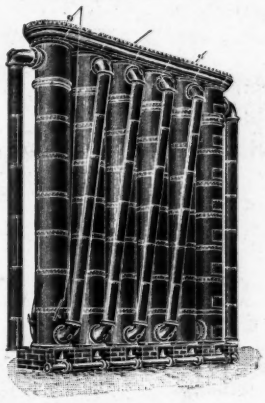
H. GREENE & SONS, LTD.
19, FARRINGDON ROAD, E.C.
Telephone: 1215 HOLBORN. Telegrams: "LUMINOSITY."

TO GAS AND GENERAL ENGINEERS.

GUARANTEED AND UP TO DATE
BUY DIRECT FROM THE MAKER
JACKSON CYCLES
LADIES & GENTS
LISTS FREE
£7-10-0.
JACKSON CYCLE Co. COVENTRY.

Easy Payment System. Particulars on Application.

FOR SALE, EXCEPTIONAL BARGAIN IN SECOND-HAND
ANNULAR CONDENSERS
as per Illustration below.



In perfect Order and Condition.
Complete with 16-inch Valves and Connections.
Diagonal Tubes dispensed with if desired.

Cheap, less than Half New Price accepted.

J. FIRTH BLAKELEY & CO.,
THORNHILL, DEWSBURY.

Inspection Invited. Photo, &c., on application.

WELLS' "LIGHTNING" PAINTER
LIME AND COLOUR WASHER.
(WALLWORK & WELLS' PATENTS.)
OVER 400 SOLD.

Painting Speed—3 Square Yards a Minute.
Lime-Wash Speed—12 Square Yards a Minute.

No. 1	Painter	£25	Single Air Compressor	£17 10
No. 2	"	£30		
No. 3	"	£35	Double ditto	£27 0

Vertical Steam-Engine and Air-Compressor combined with Boiler on Wheel Base - £100

As supplied to the following—

The Gaslight and Coke Company, the South Metropolitan Gas Company, the Glasgow, Birmingham, Preston, Burslem, Warrington, Liverpool, Nottingham, Oldham, Stockport, and West Bromwich Corporation Gas-Works, &c.

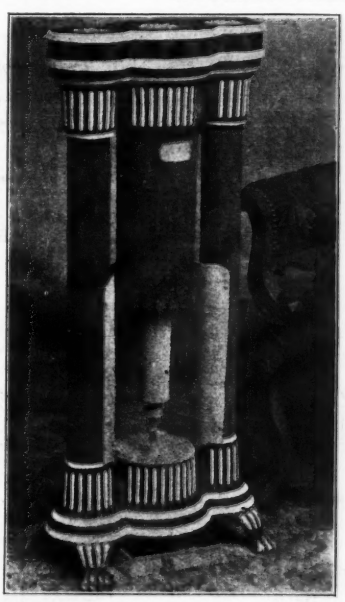
A. C. WELLS & CO. 113, Midland Rd., St. Pancras, LONDON.
Works: CHEETHAM, MANCHESTER.

Sixth Edition. Morocco Gilt, 21s. Roan Gilt, 18s.

HANDBOOK
FOR GAS ENGINEERS AND MANAGERS.
By THOMAS NEWBIGGING, M.Inst.C.E.
LONDON: WALTER KING, 11, BOLT COURT, FLEET ST., E.C.

MAURICE GRAHAM.
CONTRACTORS TO H.M. GOVERNMENT.
GRAHAM, MORTON & CO LTD
WORKS:
LEEDS.
— FOR —
HOT & COLD COKE
ELEVATORS & CONVEYORS
FOR LIME & OXIDE
FOR LARGE & SMALL COAL
ELEVATORS & CONVEYORS
WE ARE MAKING THREE COMPLETE PLANTS TO HANDLE 150 TONS PER HOUR EACH.

THE "LUX-CALOR" TRADE MARK.
RITCHIE'S PATENT



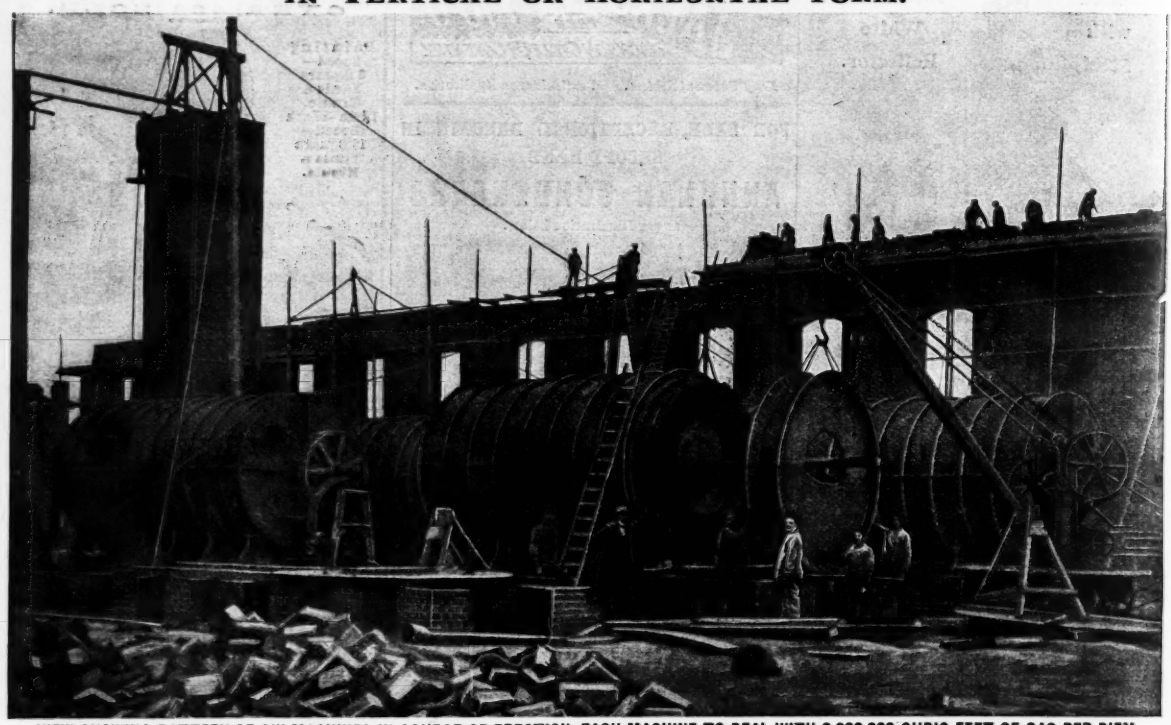
UNEQUALLED

FULL PARTICULARS FROM
RITCHIE & CO.,
Contractors for Automatic Supplies to the Gaslight and Coke Company and the South Metropolitan Gas Company,
46, HATFIELD STREET, SOUTHWARK, S.E.
(*Near Blackfriars Bridge*)
LONDON. TELEPHONE 1533 HOP.

W. C. HOLMES & CO.'S

PATENT "NEW" SCRUBBER-WASHER

IN VERTICAL OR HORIZONTAL FORM.



VIEW SHOWING BATTERY OF SIX MACHINES IN COURSE OF ERECTION, EACH MACHINE TO DEAL WITH 3,000,000 CUBIC FEET OF GAS PER DIEM.

W. C. HOLMES & CO., Contractors to His Majesty's Government, TURNBRIDGE, HUDDERSFIELD.

R. DEMPSTER & SONS, LD. ELLAND, YORKS.

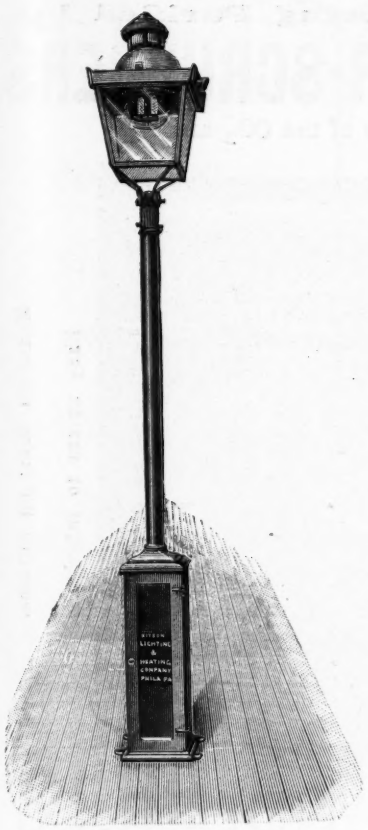
Telegrams: "DEMPSTER, ELLAND."

Telephone: No. 8 ELLAND.

View of Six Purifiers, Superstructure, Roof, &c., erected by R. Dempster & Sons, Ltd. (*From a Photo.*)

CONTRACTORS FOR EVERY DESCRIPTION OF GAS APPARATUS.

Carbonizing Plants a Speciality.



THE

"KITSON" OIL LIGHT

(VAPORIZED PETROLEUM BURNT WITHIN A MANTLE.)

1200-Candle Power, 1d. per Hour!!!

For Streets, Stations, Yards, Factories, &c., &c.

A System of Lighting surpassing all others in respect of

EFFICIENCY AND ECONOMY.

Self-contained Lamp-Posts.

No tearing up of the Thoroughfares.

See Professor Lewes and Dr. Boverton Redwood's Joint Report.

("JOURNAL," *Feb.* 5, *p.* 338.)

KITSON LIGHTING AND HEATING SYNDICATE, LIMITED,

BLACKFRIARS, LONDON, E.C.

The LEEDS FIRECLAY CO., LD.,

Telegrams: "SETTINGS, LEEDS." Telephone: No. 1332.

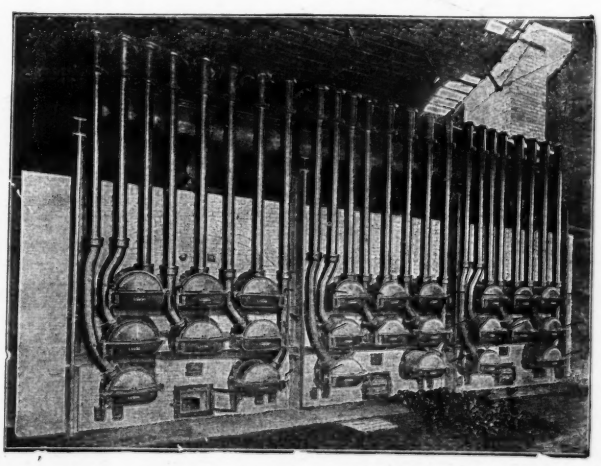
WORTLEY, LEEDS.

ENGINEERING DEPARTMENT

RETORT

INCLINED, HORIZONTAL, REGENERATOR, GENERATOR, AND DIRECT FIRED.

RETORTS RE-SET.



SETTINGS

SHALLOW REGENERATORS A SPECIALITY.

NUMEROUS TESTIMONIALS.

GUARANTEED RESULTS EXCEEDED IN MOST INSTANCES.

SOLE MAKERS OF HUDSON & RANN'S PATENT AUTOMATIC CHIMNEY DRAUGHT REGULATOR.

MOUTHPIECES, WITH SELF-SEALING OR LUTED LIDS.

BENCH, FURNACE, AND FLOOR IRONWORK ROOFS.

CONDENSERS, WASHERS, SCRUBBERS. PURIFIERS, GASHOLDERS, &c.

COAL & COKE BREAKING, ELEVATING, & CONVEYING MACHINERY.

CONTRACTORS FOR COMPLETE GAS-WORKS.

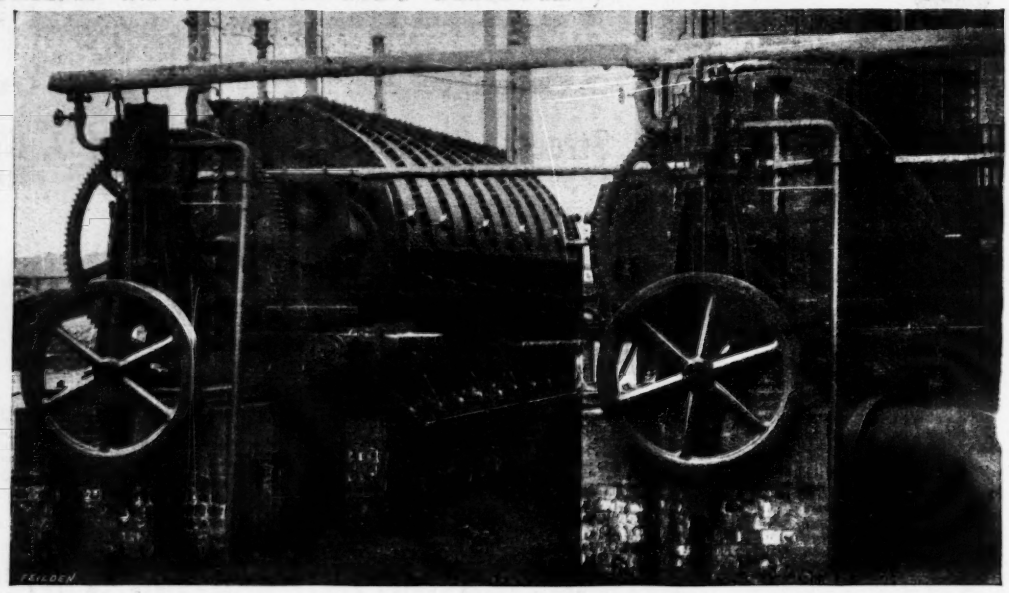
642,000,000

Cubic Feet of Gas per day are now being Purified by

PATENT "STANDARD" WASHER-SCRUBBERS

which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

[Prevention of Slip of Gas Unwashed.
Strength of Liquor Concentrated.



Maximum Washing Surface.
Easy access to interior.

KIRKHAM, HULETT, & CHANDLER, LD.

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

THE GAS-METER COMPANY,

MANUFACTURERS OF LIMITED.

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM (LATE WEST & GREGSON). Established 1830.

For Prices and Particulars apply to

F. W. CHURCH, Secretary.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Address: "METER."

[See Advertisement on back of Wrapper.

CONCERNING
SLOT . . .
AND OTHER
GAS . . .
COOKERS. .

We are prepared to Contract
for the supply of . . .

GAS COOKING STOVES

to Gas Companies and Corporations.

Large Stocks.

Deliveries Guaranteed.

THOUSANDS SUPPLIED TO LEADING LONDON AND OTHER COMPANIES.

CANNON IRON FOUNDRIES, LIMITED,

Head Office and Works:
DEEPFIELDS, NEAR BILSTON, STAFFS.

London Office and Show-Room:
BATH HOUSE, 57-60, HOLBORN VIADUCT, E.C.

THE

MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

PREVENTS NAPHTHALENE DEPOSITS.

OVER 100 MAXIM PATENT CARBURETTORS HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Seven Years.**

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

A "NEEDFUL" EXPLANATION.

INCLINED RETORTS.

An Advertisement has been running in these Columns for a considerable period warning the Trade generally against Infringing the Patent Rights of the **NEW CONVEYOR COMPANY OF BIRMINGHAM.**

An action was instituted by that Firm against **THE BRIGHOUSE CORPORATION** in the High Court of Justice asking for an injunction restraining them from Infringing their alleged Patent Rights.

After entailing considerable expense upon themselves and upon the Corporation, the **NEW CONVEYOR COMPANY** had to abandon the Action, and have **NOW TO PAY ALL COSTS AND EXPENSES** connected with the same.

JONAS DRAKE & SON, OVENDEN, HALIFAX.

GRAHAM, MORTON, & CO., LIMITED, LEEDS.

W. J. JENKINS & CO., LIMITED, RETFORD.

WINSTANLEY COMPANY, COVENTRY.

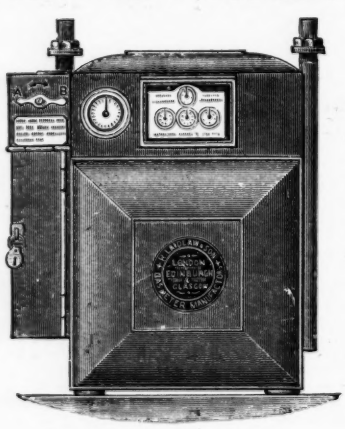
R. LAIDLAW & SON

GAS & WATER ENGINEERS.

MANUFACTURERS OF WET & DRY GAS-METERS,

SIEMENS WATER-METERS,

PREPAYMENT GAS-METERS.



—DRY METER.—

—WET METER.—

EDINBURGH: SIMON SQUARE WORKS. | **GLASGOW:** ALLIANCE FOUNDRY. | **LONDON:** 6, LITTLE BUSH LANE.

CONTENTS.

EDITORIAL NOTES.

GAS, LIGHTING, &c.—
Electrolysis and the Common Law . . 1105
Coal Exports 1105
North of England Association Meeting—The Federation of Gas-Works Employers 1106
Progress of Parliamentary Bills. . . . 1106
The Government and the Flash-Point of Burning Oils 1106
Coke, Arsenic, and Selenium 1107
WATER AFFAIRS—
Progress of Water Schemes in Parliament 1107
The Thames a Salmon River 1108

ESSAYS AND REVIEWS.

High-Pressure Gas Lighting *in Excelsis* . . 1108
Gas Engineering and the Institution of Civil Engineers—Another South Metropolitan Advance 1109
Electric Lighting Memoranda 1110
Knudson on the Electrolysis of Street Mains 1110
Gas and Water Stock Market 1112
Water Supply of New York 1112

COMMUNICATED ARTICLE.

Edouard Delamare-Deboutteville: A Memoir. By Bryan Donkin, M.Inst.C.E., &c. 1114

TECHNICAL RECORD.

Modern Gas Practice—Discussion on Mr. H. E. Jones's Paper 1116
The Glasgow Exhibition 1118
Physical and Chemical Effects of Artificial Illuminants 1120
North of England Gas Managers' Association—Half-Yearly Meeting at Newcastle-on-Tyne—
General Business 1121
Federation of Gas-Works Employers . . 1121
The New Gasholder at St. Anthony's . . 1123
Chemistry and Engineering—The "James Forrest" Lecture by Dr. Clowes . . . 1124
Water Gas and Other Combustible Gases . 1125

NOTES.

The Working Value of the Sun's Heat . . 1115
The Gas Power Electric Engines at Belfast . 1115

NOTES (*continued*)—

Combustible Gases in the Atmosphere . . 1115
A Curious Syphon Pipe. 1115
Catalytic Sulphuric Acid 1115
An Example of Natural Ventilation . . . 1115

CORRESPONDENCE.

The Coal Export Duty 1126
Mr. Young's 6·4d. 1126
Gas at the Glasgow Exhibition 1126

PARLIAMENTARY INTELLIGENCE.

Progress of Bills 1127
House of Commons Committees—
Mond Gas Bill 1127
Devonport Corporation (Gas) Bill . . . 1129
Wells (Somerset) Water Bills 1131

MISCELLANEOUS NEWS.

New Gas-Works for the Perth Corporation—Closing of the Old, and Opening of the New Works 1132
The Paris Gas Company and the Municipality—The Question of Reducing the Price of Gas 1134
Birmingham Corporation Gas Supply—Growth of the Gas Undertaking; £410,000 Needed 1135
Results of the Year's Working at Rotherham—A Loss on the Gas Supply 1135
Gas and Water Finances at Huddersfield . 1136
River Plate Gas Company, Limited . . . 1136
Electric Lighting of Artisans' Dwellings. . 1137
Electric Lighting Notes 1137
Comparison of Gas and Electricity—A Gas Manager's Defence of Gas 1137
Messrs. Richmond's Profit-Sharing Scheme—Bonus Day at Warrington. 1138
Stock and Share List 1138
The Montreal Lighting Amalgamation . . 1139
Washburn Valley (Leeds) Water Scheme—Arbitration Proceedings 1139
Notes from Scotland 1140
Current Sales of Gas Products 1142
Coal Trade Reports 1142

PARAGRAPHS.

Coal Exports Last Year. 1107
Improved Ventilation of the Royal Courts of Justice—Professor Hull on Coal Export Duty 1108
North British Association of Gas Managers. 1109
Additional Paper for the Institution Meeting—Estimation of Arsenic in Coke . . . 1112
Personal and Obituary 1113
Guides to the Patent Office Library—Intensified Gas for Lighthouses 1113
The Shrinkage of Earthwork 1123
Gas Coal in Borneo 1125
Ardrossan Gas and Water Bill—Elland Gas Bill 1127
Water Supply of Tunbridge Wells—Horley District Gas Bill—Water-Pipe Destruction in New York 1132
A New Reservoir for St. Helens—An Ironmonger on Municipal Trading 1134
Bombay Gas Company, Limited 1135
Kidderminster Water-Works Disclosures . 1136
Artesian Borings in Queensland—Stafford Water Supply—New Water-Works for Looe—The Minutes of the Gas and Electricity Committees of the Coventry Corporation 1143
Manchester Gas Profits and the Rates—New Joint-Stock Companies — Water-Works Purchase Scheme Rejected at Louth—The Middlesex Gas-Meter Testing-Station—Gas *v.* Electric Lighting at Bath—Keighley's Successful Gas Undertaking—Waste of Water at Budleigh Salterton 1144
Subways for Electrical Wires—Strike at the Tyldesley Gas-Works—Well Water for Street Cleansing—The National Registration of Plumbers—The Accident at the Birmingham (Windsor Street) Gas-Works 1145
Hadley and Ketley Water Supply—The Fatal Gas Explosion at Sheffield—Water Supply by Meter—Margate Water Supply—Regenerative Retorts for the Ellesmere (Salop) Gas-Works 1146
Intensified Gas in Manchester—Sales of Stocks and Shares—The Flash-Point of Oil—Gas-Works Extensions at Ripon—Rochdale Water-Works Finances 1147

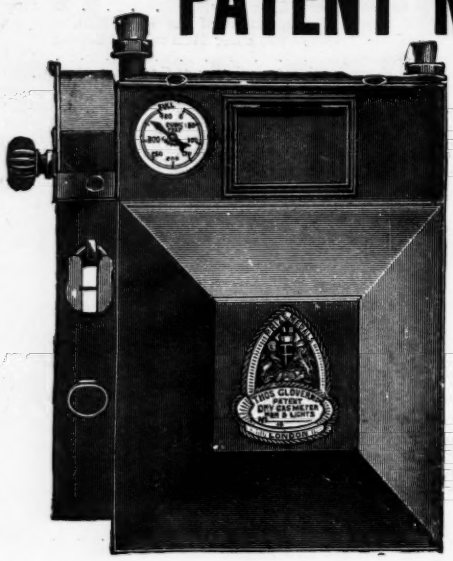
Messrs. HUMPHREYS & GLASGOW

CARBURETTED WATER-GAS PLANT

38, VICTORIA STREET,
LONDON, S.W.
Telegrams: "EPISTOLARY, LONDON."

UNITED STATES OFFICE:
BANK OF COMMERCE BUILDING,
NEW YORK.

THOMAS GLOVER & CO.'S PATENT NEW IMPROVED PREPAYMENT METER



For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 38, BATH STREET. *Telegraphic Address: "GOTHIC."* Telephone No. 1008.

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC"*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."* Telephone No. 3398.

GLASGOW: 69-71 McALPINE STREET. *Telegraphic Address: "GASMAIN."* Telephone No. 6107.

PARKINSON AND W. & B. COWAN, LTD.

(PARKINSON BRANCH.)

W. PARKINSON & CO. have introduced this design of Station Meter in order to meet the demand for a more ornamental Tank. All joints are planed, the most modern improvements introduced, and the entire Meter is of the strongest and most substantial description.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegrams: "INDEX." Telephone No. 778 King's Cross.

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegrams: "GASMETERS." Telephone No. 1101.

[See also Advt. on last White Page.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1981.—TUESDAY, APRIL 30, 1901.

EDITORIAL NOTES.

Electrolysis and the Common Law.

THE question of electrolysis is very much with us, and its interest is likely to become more rather than less acute as time goes on, or until Parliament and the Law Courts have quite settled the manner in which solicitude for this new incident of material civilization shall be divided among the affected parties. For it would be a grave error to suppose that the whole of the responsibility for whatever may be the result of the use of electric traction for tramways in the United Kingdom can be concentrated upon, and limited to, one particular party to the innovation. Let us take this opportunity for proclaiming, in the hearing of all whom it may concern, that no absolute negative to any expedient act of service to the community can be contemplated by those whose very existence depends on their ability to faithfully render another kind of service. There ought, therefore, as between undertakers of electric tramways and undertakers of gas and water supply, to be no question of irreconcilable antagonism. All are on the same plane, and must be in very truth "obedient "humble servants" of the public, by whom and for whom they live. This being understood—and we venture to think that the greater age and wider experience of the gas and water industries have rendered them more rather than less tolerant of spirit than new comers in the field—there should be no difficulty in the way of a general understanding as to the proper division of the burden of all fresh responsibilities. Certain representatives of the interest of electricity supply are, or affect to be, greatly annoyed at the declared intention of Parliament to make the providers of electric traction for tramways responsible for all electrolytic damage that may be suffered by gas and water mains in the localities where they carry on their business. It is pretended that, so long as any protective regulations which may be imposed by the Board of Trade are rigidly obeyed, the liability of the electric tramway proprietary in this regard should be discharged. This contention cannot be accepted for a moment; and we do not believe that the best professional opinion on the electrical side will be found to support it. After all is said and done by way of paper regulations and guarantees, the proof of the pudding must be in the eating. It saves superfluous friction and waste to proceed according to rule and measure; but no man can be expected to say in advance that prescriptions shall never be reviewed in the light of experience of their effects.

In regard to this question of electrolysis, there appears (as we have said) to be a wish on the part of a certain section of professional electricians either to abide by prescribed regulation, as in the instance of Board of Trade rules, or to fall back upon the power of common law. They seem to argue that, if they are not to be allowed to shelter themselves behind the specific rules laid down by independent authority, they should be permitted to exercise their own discretion as to their proceedings, subject only to the common-law obligation which governs the mutual relations of all members of the community. The common law is, of course, the inalienable possession of all subjects of the realm; and be it far from us to impugn its virtue as the last resort of His Majesty's lieges in all cases of wrong. But it is cumbrous; and in the ordinary affairs of life it has generally been found expedient to make a short cut to a means for protection from specific kinds of wrong. That is really the foundation of half the statutes.

In another column will be found a statement of the views on electrolysis which prevail with experts in the United States. There, it may be observed, the matter has been left to the arbitrament of the common law. No such decision as that which vexed the souls of some of our English electricians in respect to the Sheffield precedent could be given in the United States, owing to the absence of anything like the same national authority. We recently gave in the "JOURNAL" the first decision of a United States Court on the common law aspect of electrolytic damage. It was that of *The Manufacturers' Natural Gas Company v. The Indianopolis Street Railway Company*. The Court found, as a matter of fact, that the method used by the defendants in carrying on their business resulted in serious injury to plaintiff's pipes. They also found that the defendants could, by known and reasonable methods, so work their cars as to avoid doing this injury; while the plaintiffs could not, by any known method, protect their pipes from injury. The plaintiffs' pipes were in the street by legal authority, and constituted a taxable and vendible property. The defendants made use of them as a conductor for the return current, greatly to their detriment. This appeared to the Court to constitute a taking of private property for extraneous use, for which compensation ought to be made.

The question was admittedly a new one; and therefore the Court were without precedent for their guidance. But they were adequate to deal with the issue, not by inventing a new legal principle, but by expanding the old and well-recognized principles of law and equity so as to meet and cover the new situation. It was admitted that it would be a reproach to the national system of jurisprudence and its administration, if a situation could arise in which large and material injury should be done to legal rights, and destruction caused to property, without legal remedy. Therefore the Court held that the Street Railway Company in question had been negligent in using their powers in such a manner as to cause the injury complained of. This judgment appears to cover the ground; and the matter can therefore be left here. The record satisfactorily rounds off the tale told in our article, and ought to remove every vestige of disagreement over the principle between those responsible for electricity supply and gas and water undertakings in English-speaking communities.

Coal Exports.

IT is evident that, in spite of the clamour of the coalowners, shippers, and miners during the past ten days, nothing short of a Government defeat in the House of Commons will suffice to countermand the duty now being enforced upon coal exports. Sir Michael Hicks-Beach has always been credited with possessing a backbone that would not yield easily to pressure; and the coal trade—one of the most powerful organizations in the country—has found that the Chancellor does not belie his reputation. It was at one time a standing joke in some of the papers, that, at meetings held to agitate for redress for the decadent agricultural interests, the speakers used to emphasize their indignation by smiting the table with gold-headed canes, while their afflicted brethren sat applauding them in their fur-lined coats. The market price of coal shares, and the latest balance-sheets of colliery companies, have to-day the same discounting effect upon the public as had the gold-headed canes and the fur-lined coats in former days. They give rise to the thought that one would willingly bear the affliction of the tax, if one might only possess the property.

With decided opportuneness, the Annual Statement of the Trade of the United Kingdom was published last week, giving detailed particulars of the fuel exports last year from this country, compared with the same details for the four preceding years. The total quantity of fuel (other than bunker coal) shipped in 1900 was 46,098,228 tons, of which 985,365 tons were coke and cinders, 1,023,666 tons patent fuel, and 44,089,197 tons coal. The shipments of coke show an increase of 118,070 tons over 1899, but were only 7038 tons in excess of the 1897 figure, which was, however, exceptionally high. The patent fuel exports fell off 40,111 tons, as compared with 1899, but were about 50 per cent. higher than in any of the three years 1896-8. Coal itself shows an increase of 2,908,865 tons over 1899, of about 9,000,000 tons over either 1897 or 1898, and of 11,141,517 tons over 1896—an increase of 34 per cent. in four years. The whole of this increase, with the exception of about 40,000 tons, went to foreign countries, the exports to our Colonies being only that small quantity higher in 1900 than in 1896. Of the total exports of 46,000,000 tons of fuel last year, only 2,822,467 tons went to British possessions, and much of that was for the use of our own ships at our coaling stations. Looking at the individual countries which buy coal of us, it is seen that the great increase of recent years is more than accounted

for by the growth of our coal sales to Europe, and especially our nearest neighbours. To not a few of our most distant customers, our shipments are steadily declining. To the United States, Cuba, the West India Islands, and Mexico together we sent nearly 390,000 tons in 1886; last year only about 120,000 tons. Peru, Chile, and Brazil show together a falling off of over 200,000 tons; Java another 40,000 tons; while our exports to India were only 100,000 tons last year, as compared with 628,000 tons in 1896, and 433,000 tons in 1899.

Such, then, has been the effect of the high prices on the markets within reach of the American, Indian, and Australian coal mines. With trade so markedly less active on the Continent, and with an artificial increase of 1s. in the price of coal, there is certainly a possibility that our exports of fuel this year may show a decided falling off from the figures of 1900. Even if the Chancellor does not exempt from duty any considerable quantity of the coal sold prior to Budget day, it appears to be somewhat doubtful whether his estimate of the revenue to be derived from the tax will be realized. Certainly, the gas industry, and coal consumers generally, have no reason to be dissatisfied with the present position of affairs. The threat of the men to bring about a general strike, to protest against the duty, need not be seriously entertained. It would be too obviously a resort to the expedient of cutting off one's nose to spite one's face, to be adopted except by the most foolish of men. And while granting that the miners are often fools to their own interests, we are not prepared to accuse them of such arrant folly as would be displayed by men who could adopt the policy advocated by some of the miners' leaders—advocated simply as a piece of bluff. We only wish we could feel as sure there would be no trouble in Scotland over the wages question during the coming month, as we feel confident that the miners are not coming out on strike against the export tax.

North of England Association Meeting—The Federation of Gas-Works Employers.

During his presidency of the North of England Gas Managers' Association, Mr. E. H. Millard has been unfortunate in that, in common with other gas organizations, there has been a lamentable dearth of technical matter for discussion. At the first meeting a paper was not forthcoming; and at the second, the members found themselves in a like position. In an Association of the dimensions of the North of England, such a state of affairs ought not to exist. A noteworthy feature of Mr. Millard's year of office, however, has been the very large accession of new members and associates. Of the former class fifteen have been enrolled, and of the latter seventeen. If this influx of fresh men does not renew the vitality of the Association, then their incoming will have been worthless; and we therefore look for a return to the old order of things. But although there was no paper for consideration last Saturday, there was an excellent discussion on the report presented by the Committee regarding the proposal put forward at the October meeting, by Mr. Bower, respecting the federation of gas-works employers. There was no equivocation about the form in which the Committee delivered their decision. They gave a plain statement of the points which had weighed with them; and they ended by unanimously recommending that the matter should be dropped. We are in accord with the Committee in doubting the fitness of a Technical Association such as this to alone take up such a matter. But, on the other hand, we think that the Committee made a fundamental mistake in confining their inquiries on the subject to the members of the Association. The proposal was for a federation of "gas-works *employers;*" and we take it that the term "employers" is comprehensive enough to embrace the Directors and Committees of gas undertakings.

This broader view undermines some of the arguments advanced by the Committee. As it is apparent, on the face of the report that they did not take counsel with the supreme heads of the gas undertakings represented by the members, we cannot admit that the Committee "very care-" fully considered the matter in all its bearings." Rule 2 of the Association (which states its object) is regarded as a barrier to the pursuit of the question; but we fail to see anything which puts it outside the meaning of the words "and the encouragement of discussion of *all matters* connected "with the manufacture and distribution of gas and its pro-"ducts." By referring to the subject in this way, we do not intend readers to understand that we give the proposal our adhesion; but what we should have liked to see is a wider and deeper consideration and investigation which the use of the words "gas-works employers" rendered permissible. Both the funds and the rules of the Association were adequate for an initiatory movement of larger scope than was taken; and even if the suggestion had not become an actuality, material would have been furnished which would have been useful to the gas industry. We have now the views on the question of a majority of the members of the Association who were present on Saturday; it would have been equally interesting to have obtained those of the Chairmen of Committees and Boards of Directors at the same time. Then, and the reasons are not far to seek, the public discussion of the policy of federation would have been rendered easier.

Mr. W. Doig Gibb, the Engineer of the Newcastle and Gateshead Gas Company, provided an item later on for the day's programme, which proved equally as instructive and interesting as a paper would have been. The large new gasholder which is being constructed at St. Anthony's, from his plans, had just reached that stage in its erection when the members could make a critical examination of its design; and he invited them to do so. We cannot refrain from adding our compliments to the many which Mr. Gibb received on Saturday respecting the character of the work. The President of the Association for the coming year is Mr. Dunn, who has long taken a vigorous share in its affairs, which entitles him to the highest honour the members can confer.

Progress of Parliamentary Bills.

The Committee work of the parliamentary session recommenced in earnest last week; and progress was made with the Gas Bills awaiting consideration by the House of Commons. The Crawley and Horley case was disposed of; and the Committee presided over by Colonel A. C. E. Welby were relieved of the difficulty of settling the gas affairs of Long Eaton by the parties coming to an agreement which included a reduction of the initial prices. Then, on Friday, the same Committee, having thus already learned something about gas supply as ordinarily conducted, began their heavy work upon the Mond Gas Bill. The promotion of, and opposition to, this measure appears to have enlisted the services of a large number of eminent Counsel and experts; and it is to be regretted that the hearing should clash with the annual meeting of the Institution of Gas Engineers. Attendance of members at the meeting cannot but suffer from the counter-attraction of the important issues being tried out in the immediate vicinity.

The gas affairs of Devonport were also disposed of to the satisfaction of all parties, by the Company agreeing to sell their undertaking to the Corporation. The moral of this transaction lies upon the surface. The statutory circumstances of the Company were peculiar, inasmuch as they have kept out of Parliament for 48 years. They have only been able to indulge this perverse fancy by deliberately making all their extensions for years past out of profits; and, doubtless with the best intentions, the Company have practised a policy that eventuated in prostrating the undertaking before Parliament and the Local Authority. The Company have suffered, and the proprietors will suffer, for this; and the fate that has overtaken them was inevitable. The result will be interesting to watch. Devonport will be the unique example of a municipalized gas undertaking in the part of the country to which it belongs. It will have the advantage of a rapidly-growing district; but it will, of course, be a long time before it will enjoy anything like the prosperity of Plymouth, its big neighbour. The local public appear to thoroughly understand the nature of the administrative problems that will confront the Corporation when they come into possession of this jealously-guarded property; and there can be no question of keeping up the price of gas with the object of making "profits" in aid of the rates.

The Government and the Flash-Point of Burning Oils.

Once more the London County Council have been snubbed by a Government Department. It was over the well-worn craze of the Council for raising the cost of lamp-oil in this country, which is warmly admired by the Scotch oil refiners, and is for some more mysterious reason espoused by a few London Radical newspapers. The factitious agitation for raising the flash-point of burning oil ought to command the enthusiastic support of representatives of the gas industry, if they were as narrow-minded and short-sighted as some of the "interests" that unblushingly seize on every opportunity for grinding their own axes at the mill of public opinion;

because oil with a flash-point of 100° Fahr. and upwards would be both scarce and dear, and consequently less able than the present supply to compete with gas. We, at any rate, have consistently opposed the agitation in question, on the ground that it proposes an intolerable restraint upon trade, for which there is not the smallest valid reason. The "Daily Chronicle," as usual, professes to see ample justification for the proposal in the asserted fact "that "the American Trust is permitted to sell in this country "a quality of oil which it is forbidden to distribute in the "country of its origin." The tireless repetition of these ancient half-truths is almost enough to make one despair of the results of unlicensed printing. Of course, Mr. Ritchie had no difficulty in disposing of the case for raising the flash-point presented to him by the Chairman of the Public Control Committee of the London County Council. After reading the various arguments mentioned by the deputation that waited upon the Home Secretary, one is constrained to think that the ancient Bourbons must have been the Progressives of their era, for both share the pleasing characteristic of learning nothing and forgetting nothing.

Coke, Arsenic, and Selenium.

INTEREST in the mineralogy of gas coke, with particular reference to the alleged poisonous nature of some of the substances occurring in this hitherto blameless fuel, is greatly on the increase. At the last meeting of the Nottingham Section of the Society of Chemical Industry, two well-known analytical chemists expatiated on the difficulty of accurately estimating minute quantities of arsenic in such a substance as coke, and explained how they attack the problem. It does not read like an easy, or a particularly convincing proceeding. The sample of dry coke, weighing 50 grammes, has first to be finely ground and sifted, and then boiled in nitric acid for at least two hours. It is to be hoped that both acid and vessel are of unexceptionable character. Next the liquor has to be diluted with water, filtered, and evaporated with a dose of pure concentrated sulphuric acid, until every trace of nitric acid has been got rid of. The residue is dissolved in water, mixed with salt and sulphate of iron, and distilled again. Several other stages have to be gone through, which it would be tedious to detail; and in the end, the small and elusive arsenic is hunted down and forced to surrender. The non-technical person, reading all this thrilling story, might be pardoned for wondering where the arsenic really comes from. And behind this, again, lies the question of sampling. How far can 50 grammes—about 1½ oz.—taken out of a coke-heap, be trusted to represent the mass?

The arsenic of coke also came up again in the course of the resumed sittings of the Royal Commission last week. One of the witnesses asked that a standard of purity of malt might be fixed, as it is impossible to guarantee even anthracite to be absolutely arsenic free. On the other hand, the chemist to Bass's brewery testified that malts dried with a proportion of gas coke contained more arsenic than those dried with a proportion of oven coke. He, however, asked that some authoritative method of determining minute quantities of arsenic might be prescribed. Sir Lauder Brunton, in his evidence, laid stress on the recent remarkable discovery by Professor Tunnicliffe of selenium in beer. That is a truly notable discovery; and nobody can say off-hand how far it affects coke, in which selenium has been found—in the same sense as it has been detected in other earthy substances. These strange elements, that is to say, exist pretty well everywhere, in infinitesimal quantities; and it would be no easy matter to keep them out of manufactured products.

Coal Exports Last Year.—A parliamentary paper just issued shows that during last year 44,089,197 tons of coal were exported from the United Kingdom, as compared with 41,180,300 in 1899—an increase of 2,908,897 tons. Of the total sent away last year, 18,459,207 tons went from Cardiff, Newport, and the other Bristol Channel ports. The next largest quantity was that shipped from the North-Eastern ports (Newcastle, Shields, Sunderland, Hartlepool, &c.), the number of tons being 13,135,435—an increase of about 827,000 tons over the previous year. From the East Scotland ports, which include Leith, Grangemouth, Dundee, &c., 5,779,153 tons were sent—an increase over the previous year of about 1,216,000 tons. From the Humber ports, 4,126,616 tons were exported. The exports to France, Portugal, Spain, Italy, South Russia, Morocco, Egypt, &c., were the heaviest; the total being 21,067,742 tons—an increase of upwards of 1,530,000 tons over the shipments for the previous year. The aggregate shipments to North Russia, Sweden, Norway, Denmark, Germany, Holland, Belgium, &c., amounted to 18,108,371 tons—an increase of 1,713,000 tons.

WATER AFFAIRS.

Progress of Water Schemes in Parliament.

SINCE the resumption of business in the Committee-rooms at Westminster after the Easter recess, some noteworthy progress has been made in connection with the water legislation of the session. In the first place, the scheme for the constitution of a Joint Board, composed of representatives of the Corporation of Ilkeston and the Heanor District Council, to acquire the undertaking of the Meerbrook Sough Company, purchase lands, construct additional works, and extend and also improve the water-works of the Council, has been sanctioned, and authority given to raise money to the amount of £124,000 for the above-named purposes, with such additional sums as the Local Government Board may sanction. The Committee had various interests to deal with; but opposition to the measure was not so serious as to cause its rejection. The decision to allow the Bill to go forward is a further affirmation of the principle of joint control of a water undertaking by Local Authorities. Another point to which attention may be directed arose in connection with the Tendring Hundred Water Bill, which was reported upon last Thursday by the Chairman of Ways and Means. Its object was to enable the Tendring Hundred Water Company to extend their limits of supply, construct additional works, and raise more money. The Local Government Board reported upon the Bill, as usual, and effect was given to all their recommendations except one, which was that the annual value to be taken as the basis of assessment for water-rates should be calculated on the poor-rate instead of on the rack-rent. Mr. Lowther pointed out that if this recommendation were adopted, it would disorganize the Company's existing scale of charges. These have never been objected to in the district, which is a scattered one, extending over some eighteen parishes, and not remunerative even under present circumstances. This being the case, the reason for the Board's recommendation is not very clear. If there had been an outcry against the existing rates, revision might have been called for.

Two Bills which contained the elements of a parliamentary fight—those promoted by the Corporation of Wells (Somerset) and the Water Company—were disposed of last week by Mr. Arthur Elliott's Committee. The Corporation wished to acquire the Company's undertaking on arbitration terms; but as negotiations failed, they unanimously decided, backed by a very substantial majority of the ratepayers, to apply to Parliament for the necessary power to purchase, and also to construct a reservoir and extend the limits of supply. The Company also sought authority to carry out additional works, which they contended would be sufficient for the requirements of the city, without imposing upon the ratepayers the burden which the scheme of the Corporation would entail. Moreover, they submitted that they were the proper parties to manage the water supply. The witnesses for the Corporation were, however, able to satisfy the Committee that the general feeling of the inhabitants was in favour of municipal control, even if it cost them £15,000 or £20,000, as this was regarded as the best way of obtaining a constant supply of water, for which a higher rate would be willingly paid. In view of this fact, Mr. Elliott threw out a remark, towards the close of the first day's proceedings, which indicated the feeling of the Committee on the question of acquisition, and led to a consultation between the parties. The result was that the next morning the Counsel for the Corporation announced that he had been able to make concessions to the other side which he hoped would remove some of the matters in dispute. He mentioned two of them, which practically settled the business. The Corporation were quite willing to allow the full 10 per cent. for compulsory purchase, and to undertake that all the officers of the Company of more than twelve years' standing who were not retained in the service should be duly compensated. These terms were accepted by the Company, who thereupon dropped their Bill. It is to be regretted that, in view of the willingness shown by the Corporation to come to terms, and of the prevalent feeling among the inhabitants in favour of the municipalization of the water undertaking, a satisfactory settlement of the differences between the parties was not sooner arrived at. However, all's well that ends well. The Corporation obtain control of the water supply; the Company will receive a fair price for their property; and their servants, who have

helped to give it its present value, will be compensated for any injury they sustain by its transfer to other owners.

The Thames as a Salmon River.

The large proportion of the water supply of the Metropolis which is daily furnished by the Thames (105 million out of a total of 196 million gallons last month) makes the question of the condition of the upper reaches of the river one of supreme importance. We have from time to time referred to the efforts of the Thames Conservancy to keep the stream as free as possible from contamination; and we know that a watchful eye is kept upon the purifying arrangements of the Water Companies drawing from the river by Sir William Crookes and Professor James Dewar. The Conservators have been armed with increased powers which they have not failed to put in force; and the result is a generally improved quality of the water as compared with a few years ago. In the lower reaches of the river, the improvement which has resulted from the combined action of the Conservators and the London County Council has of late years been very marked, as evidenced by the fact that fish have been found at a point much higher up the stream than previously. The operations carried on at Crossness by the Council's Chemist (Dr. Frank Clowes), in association with Dr. Houston, in treating sewage bacterially, now produce an effluent which is not only clearer than the river into which it is discharged, but is of so non-putrescible a character that fish can live and thrive in it. The admittedly cleaner condition of the Thames gave rise to the hope that the stream might be once more utilized for the production of salmon, which had not been practicable for something like seventy years; and in 1899 the Thames Salmon Association was formed for the purpose of re-stocking the river. The first experiment in this direction was made last Tuesday, when 600 samlets were turned into the stream at Teddington Weir. How many will reach the sea and return, is a matter of pure speculation; but if the state of the river at Crossness is expected to prove destructive to the young fish, the conductors of the experiment may possibly be encouraged by what has been said above to hope for ultimate success.

Improved Ventilation of the Royal Courts of Justice.—A distinct improvement in the ventilation of the Royal Courts of Justice has been gratefully acknowledged by business frequenters of the building during the past year or two. The mephitic atmosphere which formerly pervaded the Courts after they had been in use for a few hours has given place to a comparatively fresh air, thanks to the skilful treatment of the problem of ventilation by Mr. J. B. Westcott, of the Office of Works. A full account of the new arrangements has been published by the "Engineer." The basis of the improvements now in operation is the provision of a supply of 1800 cubic feet of fresh air per hour—heated or cooled according to the season—at a standard temperature of 62° Fahr., for every occupant of the Court, when it is full, without draughts.

Professor Hull on the Coal Export Duty.—The "Iron and Coal Trades Review" quotes the following opinion of Professor Hull on the question of taxing exported coal: "Doubtless the State benefits by the profits of the coalowners who export and sell the coal to the foreigners; but it seems only reasonable that the latter, who are benefited by the sale of the mineral, should contribute something towards the prosperity of the country from which the mineral is derived. For recollect that coal is not a commodity which, like animal or vegetable substances, can be reproduced. Once extracted from the ground, it cannot be restored; and thus foreign countries, which in many cases have little claim to our generosity, and are (as they have a right to be) absolutely selfish where their own interests are concerned, are helping to deplete our mineral resources—in other words, to drain the life-blood of our commerce and manufactures. I hold very strongly the view that in the case of such products of Nature as coal, petroleum, and minerals, the country which produces them has a claim, or lien, upon them beside that of the owner of the soil under which the minerals are found; and, if this be so, the State, as such, has a right to be recouped for the benefit of the whole community. In the case of the owner and the utilizer, this is done through taxation on his profits; so that he is in a worse position than the foreigner who uses the mineral, but pays no tax for the benefit of the country from which the mineral is drawn. On these grounds, it seems to me that an export duty on coal from this country to Continental States may be advocated and defended; and the amount should not be less than 5s. per ton, payable at the port where the coal is shipped. If we take the export to Continental States at 40 millions of tons, an export duty of 5s. would amount to £10,000,000 per annum, which might go to the relief of our increasing taxation, or form a sinking fund with the same object in view. In any case, it would to some extent help to recoup the State for the drain on her mineral resources. Nor do I believe such a duty would have an appreciable effect in diminishing the output from the mines."

ESSAYS AND REVIEWS.

HIGH-PRESSURE GAS LIGHTING IN EXCELSIS.

The Welsbach Incandescent Gas-Light Company have responded nobly to the confidence reposed in them by the Glasgow Exhibition Authorities in handing over to them a large section—and the most important section—of the grounds for exemplifying the latest and best that can be performed by gas as a lighting agent. The opportunity and the responsibility for doing this work would have been gladly accepted by other gas lighting engineers; but while they might have done equally well, they could not, we have no hesitation in saying, have excelled. The Company have, by hard work, attention to the smallest details in perfecting their plans, and at no meagre expense, brought honour in the result upon themselves, have done their duty to the gas industry, and have earned the acknowledgments of all interested in its welfare.

In the "Journal" for the 9th of February last (p. 389), we gave an indication of the character and extent of this scheme of high-pressure lighting, together with a plan showing the disposition of the lights; and last week, on the occasion of the Press view preceding the formal inauguration of the exhibition in which Glasgow has centred its hope, we had an opportunity of seeing the fulfilment of the scheme. With one exception the completed scheme is, in its general features, precisely as we previously described it; the exception being that it has grown somewhat in dimensions. For an exposition of what can be done in high-pressure gas lighting, the situation would be hard to beat. The undulations of the grounds, the broad bridge across the slothful Kelvin, the wide and long stretch of terrace with the main building and its white stucco exterior for a background, give all that the heart of a lighting engineer could desire for a demonstration of his capability; and we may here congratulate the Manager of the Welsbach Company's Public Lighting Department (Mr. K. H. Buchanan) on having so fully grasped the requirements of the case and on his achievement, which, however, would have been impossible without the hearty co-operation of the Directors and the chief of the official staff (Mr. H. L. Peters).

The lights are disposed along the main terrace, on the bridge crossing the Kelvin, along the main avenue, and in the adjacent walks; and so a vast expanse of ground is covered and lighted. The lamp-columns were made by Messrs. M'Dowall, Steven, and Co. In all there are 140 single columns, each bearing one of the Welsbach "Shadowless" lanterns, containing a three-light cluster, giving (with a consumption of 31½ cubic feet of gas per hour, or 10½ cubic feet each burner, at 8 inches pressure) a total illuminating power of approximately 1000 candles. Then there are twelve columns with triple arms, each bearing a lantern, with a three-light cluster in each; and ten columns carrying five lanterns. This makes a total of 162 columns, 226 lanterns, and 678 burners, with a total illuminating power of 237,300 candles. The effulgence of this mighty concentration of gas-light must be seen to be adequately appreciated; for it cannot certainly be described in words. For a moment, let the reader calculate for himself at what a moderate cost this great illumination is obtained in regard to the chief requisite in the working expenses—viz., the gas. There are, we have shown, 678 burners, each consuming (say, to use a round figure) 10 cubic feet of gas per hour, which roughly amounts to a total of 6780 cubic feet. The charge for gas in Glasgow is the moderate one, in these passing days of enhanced costs, of 2s. 6d. per 1000 cubic feet; so that the total expenditure for gas to obtain a light equal to something like 237,000 candles only totals to between 16s. and 17s. per hour. This charge, as well as that for the gas required for the other gas exhibits which are there as such and are not used merely in an auxiliary office in connection with some other exhibit, will be borne by the Corporation Gas Department; and they have also supplied and laid the mains for the distribution of the high-pressure gas, which is provided by means of Keith's gas-compressors, of which more anon. For an installation of this kind, Mr. Buchanan does not expect that the mantle renewals will exceed more than (say) twelve per annum; but he is not going to spoil the ship in order to save the proverbial 'apporth of tar. For the lighting of the lanterns, it may be interesting to readers to know that torch ignition has been adopted, and Messrs. Simmance and Abady's patent torch is the one which will be used.

Now coming to the compressing plant (which has been put down by the Water-Motor and Automatic Liquid Elevator Company). It has been specially constructed for this work; and in the superintending of its erection, Mr. James Keith and his son have taken a great personal interest, in order that nothing should escape notice which might have a detrimental effect upon the lighting results. As in the case of the Welsbach Company, expense and time have not been spared in order to ensure success; and the result is a duplicate set of plant which is delightfully smooth in its action and feeds the burners with gas at a uniformity of pressure which is very desirable to prevent blemishing defections in lighting power. Each set of plant is capable of supplying the whole of the lights in the grounds; but the lighting being divided into two sections, each section has its own set of compressing plant. Arrangements, however, have been made so that, by means of a bye-pass between the sections, one machine can deal with

the whole of the grounds if it were ever necessary. The principle of the machines is exactly the same as in the smaller type. The pumps each consists of a frictionless piston—really a bell working on a water-seal. The pumps are operated by two distinct motors; the motors being so arranged that one is at the end of the stroke, while the other is at its middle—thus ensuring a constant flow of gas without pulsation. The valve motion is on the same principle as the duplex steam-pump, with the exception that the relative motion of the one to the other is controlled by a timing arrangement consisting of two small cranks at right angles, which are connected to the valve levers. The motion of the motors is controlled by a regulating holder, into which the two pumps discharge. The holder is weighted to 8 inches pressure, and controls the water supply to the motor by means of a valve and lever. The capacity of the machines is 8000 cubic feet per hour, or 16,000 cubic feet from the two sets; but, with the pressure at command in Glasgow, quite 10,000 cubic feet per hour could, if necessary, be obtained from each. Giving 8000 cubic feet, the speed of each motor is about 28 strokes per minute, which is a comparatively slow motion—the up and down strokes being counted as two. The compressors are supplied by a 6-inch cast-iron main, from which two 4-inch branches run to the inlets. The machine outlets are 3-inch; and these are connected to the 5-inch main distributing the gas through the grounds. Messrs. Keith have done their work well. The perfect action of the plant, its capability of maintaining an equality in pressure, its splendidly set-up appearance, which will bear critical examination, all speak for the thoroughness of the workmanship that has been put into their share of the arrangements for this splendid example of high-pressure lighting.

There are only a few words more to be said about the installation, and they will be our impressions as to the general effect gathered last Thursday evening when the whole of the lighting system was in operation. It was a windy night; but notwithstanding the man who could have charged the lighting with a fault would have been hypercritical indeed. Mr. William Foulis has, in an unostentatious way, taken the greatest interest in the matter; and were we sufficiently curious to probe back far enough, it would be found that it was in Mr. Foulis's brain that this great gas lighting demonstration had its origin. The exhibition being within his jurisdiction in regard to gas matters, he felt that his long fealty to the gas industry would be impaired if he allowed the electricians to have the lighting all their own way. Last September, when in Paris, Mr. Foulis was heard to say that he hoped to get in the Glasgow Exhibition an exemplification of the power of gas in lighting which would equal in proportionate intensity, if not in expanse, the high-pressure gas lighting at the Paris Exhibition. Last Thursday night the writer was with Mr. Foulis at the Glasgow Exhibition; and there as he saw the lighting, brilliant, steady, without imperfection, and flooding a large expanse of the grounds with a pure and charming light golden in tone compared with the adjoining electrical illumination, his face, to use a homely word, beamed with satisfaction. His hope has been fulfilled. "There never has been," he remarked, "such a display of gas lighting in this country; and I think it is quite equal to, if it does not exceed, the lighting we saw in the Paris Exhibition." We looked down on the lighting from points of eminence outside the exhibition; we looked at it from all points of the compass inside the grounds; and if it is upheld in the manner it has commenced (and on this score there is no fear), we need have no thought for the future of gas as an outside lighting agent in its competition with its electrical rival. When one saw in contrast the pallidness of the so-called 1000-candle power arc electric lamps, and their ineffectual attempt (though closely spaced) to shed light around them, one turned from them in sheer pity; and many besides are sure to do the same. Lighting electricians who do not wish to court a fit of the blues will steer clear of the Glasgow Exhibition grounds at night time; but members of local authorities who wish to learn the truth about the capabilities and costs of the two lights need only to look once at the comparative demonstration, and make a few inquiries. It will only be those who are absolutely obstinate or hopelessly prejudiced who will put on one side the facts and the evidence of their own eyes. The façade of the main building is a sight to look long upon under the incandescent gas lighting; on the bridge over the river even a pin on the ground could not escape the searcher; and in the avenues there is a uniformity of brilliance. We are glad to notice the lights have been placed on columns of sufficient height to secure efficient diffusion. The single columns are at least 14½ feet high; and the centre light of the columns bearing five lanterns is something like 16 feet in height.

Enough has been said on this special piece of lighting (which is the principal feature of the exhibition, regarded purely from the gas engineer's standpoint) to testify our high appreciation of the work done. There are other good examples of lighting to be seen, about which we have something to say in the article elsewhere dealing generally with the exhibition.

North British Association of Gas Managers.—The Secretary of the North British Association of Gas Managers (Mr. R. S. Carlow, of Arbroath) has issued his usual preliminary circular, informing the members that the Committee are making preparations for the approaching annual general meeting, which will take place in Glasgow in July, and inviting them to contribute to the technical portion of the proceedings.

GAS ENGINEERING AND THE INSTITUTION OF CIVIL ENGINEERS.

ANOTHER SOUTH METROPOLITAN ADVANCE.

The two last meetings of the Institution of Civil Engineers for the session which closed on Tuesday were devoted to the reading and discussion of a paper by Mr. H. E. Jones, on "Gas Manufacture." It is not an easy task for a specialist in a particular branch of engineeering to present his subject acceptably before the Institution. In a sense, the Great George Street audience are as the general public to a specialist, with the difference that it is not necessary for him to be quite so "popular" in the form of his matter as he would require to be in addressing, say, the London Institution. The civil engineers embrace, so to speak, all engineering specialists; and gas engineering has many points of contact with other leading specialities. Although such a paper as Mr. Jones's, therefore, should not be sketchy, it ought to be written in a very broad spirit, with the object of interesting in its subject men of general scientific knowledge who are not exactly experts in this line. Mr. Jones, to do him justice, kept this condition of success fairly in view; and he had his reward in two large and interested audiences.

Mr. Jones, Mr. Livesey, and Mr. Corbet Woodall united their voices on Tuesday last in commending gas engineering to the favourable consideration of rising young engineers. This was doing good service to the gas industry; and if the paper has had no other result than affording the opportunity for the utterance of this appeal in such a place, it would be amply justified. It cannot be gainsaid that gas has of late years fallen into the background of civil engineering. Few new men have specialized in gas; and there is room in it for some more of the best type of engineer. The causes of this neglect of gas engineering are on the surface. The professional and academic order of leading engineers—those who have much influence in determining the bent of a young man's studies—have given gas the cold shoulder because they do not know enough of it to feel its interest. It has seemed to them a hum-drum business, lacking in scientific attractions. The higher mathematics have found no field in gas-works; and accordingly those to whom these mental fireworks are a delight have ignored the industry.

Yet the gas industry is a very big thing in the nation and the world; and it is going to be still bigger. Some of the engineers to whom Mr. Jones spoke must have been impressed with the bulk of the operations and the magnitude of the financial interests implicated in the gas supply of London. Is there not scope enough for mechanical engineering in the handling of that immense coal supply of which Mr. Livesey spoke? The paper and the discussion must be considered as having placed gas manufacturing operations on their due level before the critical eyes of the civil engineering world. Even the professors must have learnt from the paper something in this regard. Then as to the uninteresting, routine character of gas making, which has no doubt repelled eager students in the past—this is giving way before the irruption of the new spirit of the last South Metropolitan Gas Act.

It is the London Gas Referees, and the meticulous system of checks and penalty tests which they exist to carry out, that account for the dulness, the deadness, the apparently stupid conservatism of gas-works practice. As with Building Acts, Public Health Acts, and every other system of statutory regulation of industrial and social affairs which involve the appointment of inspectors, the original intention with which the laws themselves were passed tends to disappear in the petty interest of the officials in their own performances and emoluments. Not since the old era of unrestricted competition in London Gas Supply have the suppliers been free to experiment in the direction of developing their industry on natural lines. The obligations in respect to illuminating power, freedom from sulphur, and so forth, have completely tied the hands of London gas engineers, and made them routineers with little else to care for than to avoid fines.

How can an industry—a branch of civil engineering—realize its possibilities under such a cramping and paralyzing system? No Metropolitan gas engineer, however enterprising and energetic, dares to look at any suggestion for improving his working if there is the remotest possibility that, on one day in the year, it may land him in a difficulty with the Referees. And seeing that the customary official attitude towards Gas Companies is to regard them as habitual criminals—always ready to steal half-a-candle—it is not to be wondered at that the gas manager finds it to his advantage to keep before his eyes the old diplomatist's warning: "Above all things, no zeal!" A clever engineer, therefore, unless happily endowed with a large stock of stolidity, will soon break his heart in a London gas-works. The gas examiner is his bogey. Let an inventor take a revolutionary proposal to a London gas engineer—the first points the responsible officer must think of are his illuminating power and sulphur tests. And these things are so insistent, and the requirements of the penalty gas examination so largely determine the details of the manufacture, that a steady routineer is worth more to the proprietary than any genius. Routineers are not difficult to make, if one starts by barring all initiative. And their pay is not high, either.

Herein lies the principal reason why a branch of engineering deemed to be unattractive because unprogressive, is also apt to be poorly paid. The system represented by the Referees is at

the bottom of it. Abolish penalty testing; pension off all those officials who are interested in the maintenance of the system; give the gas manufacturer a free hand to carry on his business like any other tradesman; and we should soon see the workings of a new spirit in the industry. Good men would be worth something then; and they would be paid accordingly. A radical reform of the industry in this sense would be worth all the sliding-scales and other artificial imitations of the open air of industrial enterprise. Why is it that Mr. Jones had so much to say about carburetted water gas, and so little about other novelties, actual and prospective, of gas manufacture? Simply because carburetted water gas is the one invention which London gas engineers could safely patronize; the illuminating power of the product being beyond reproach. They may be dimly aware of other possible ways of making gas—as for instance that which underlay White's hydrocarbon process; but they dare not allow their thoughts to wander to them, for fear of the photometer down the street.

Mr. Livesey made one important contribution to the available stock of information concerning the ways of popularizing gas. The South Metropolitan Company will shortly bid good-bye to 16-candle gas; and they are preparing for an unknown future in which it is hoped that the Referees will figure less and less, by pushing Welsbach lighting with might and main. Mr. Livesey and Mr. Carpenter recognize that the ordinary consumer needs to be helped to make a proper use of incandescent gas lights; and accordingly the Company have adopted the liberal practice of maintaining Welsbach burners in private use for the low charge of 1s. each per quarter when the number is less than six, and 9d. each for any greater number. It is found that the lamplighters, having grown expert in the handling of mantles and the general treatment of Welsbach burners in the public street-lamps, are a capital staff for carrying out this system. The results are becoming astounding. Hundreds of large shops are coming upon the Company's books for this service; and in a short time South London will repeat the story that was told last year of Germany, with advantages. The South Metropolitan Company must already be the largest single customer of the Welsbach Company; and it would be rash to prophesy the direct and consequential results of this bold bid for business. It is at least tolerably safe to say that electric lighting will find South London a cold country. And another consolation is to be found in the thought that there can never be any penalty testing of incandescent gas-lights. When every consumer is able to get a light of 20 candles per cubic foot of gas burnt, without any extra trouble to himself, it will be difficult for the London County Council to make much capital out of the photometry which rises no higher than the archaic figure of 3 candles per cubic foot.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Supply of St. Marylebone—Three Orders Granted—Londoners' Ignorance of Provincial Affairs—No Loans for Free Wiring—The Rashness of Edinburgh.

A good deal of fuss in a small way has been made in "The Times" over the electric lighting arrangements of the Metropolitan borough of St. Marylebone. The affair began some time ago with the resolve of the old Marylebone Vestry to undertake the supply of electricity to the district, in active competition with the Metropolitan Supply Company. The usual excuses were soon found for this desire to break a bargain entered into when the business in question was generally esteemed as anything but a safe or a profitable concern. The supply by the Company was alleged to be dear and bad; and the Vestry promised to do the work much better. The Board of Trade discouraged the proposal to employ the rate fund of the parish to compete with a private undertaking, and a price was named at which the Metropolitan Company would agree to part with the Marylebone section of their property; but the negotiations fell through, and the Vestry became defunct. Meanwhile, fresh complications arose from the action of the Company in establishing a power-in-bulk generating station outside the district, which destroyed the parochial character of the undertaking. It is obviously desirable on many accounts that electric power generating stations should be removed from residential neighbourhoods to situations where the smoke of their chimneys will not vex the soul of Sir W. B. Richmond; but the proceeding nevertheless works havoc with the Electric Lighting Acts.

The attack upon the Metropolitan Electric Supply Company has been renewed by the young borough of St. Marylebone, who are promoting an Order to enable the Council to supply the area of the borough. A Company are also applying for an Order for the same area. Thus there is a three-cornered fight going on over the bodies of the users of electric light in this Metropolitan borough, which ought to test pretty thoroughly the validity of the principle of competition which is embodied in the Electric Lighting Acts. The Board of Trade will not deny to any district the prospective advantages of competition in electricity supply; and in the present case, the Department has granted both the Orders asked for—one to the Borough Council, the other to the Marylebone Company. The object of this is that Parliament shall have the responsibility, on the Confirmation Bill, of settling the whole question of whether any, and if so what, competitive supply of electricity in St. Marylebone should be authorized. This is the only way. It will be very surprising if Parliament does not saddle the Order of the Borough Council with the requirement to buy out the Metropolitan Company; otherwise the Electric Lighting Acts would be stultified.

Would-be publicists in Metropolitan affairs seem never to know what they are talking about. Here is Mr. J. Fletcher Little, who is by way of being a personage in Marylebone, and has taken a prominent part in attacking the Metropolitan Company, citing Liverpool and Glasgow as owning their own electric supply as well for power as for light; and he thinks that it is a fine thing to remark in this connection upon the political complexion of the parliamentary representatives of these cities. He does not appear to know that both Liverpool and Glasgow, as well as Birmingham, had to buy out private pioneers in this business before they could enter upon it as municipalities. This is your London Progressive all over. He cries for the same things that the great provincial cities possess, whether it is a water undertaking or electric lighting; but he does not want to procure them in the same way.

The desperate device of Municipal Electricity Supply Committees to wriggle out of the consequences of embarking upon a rash and uncalled-for speculation, by undertaking "free wiring," in the hope of making business where none naturally exists, has been righteously stopped by the Local Government Board. No application for a loan to be applied to this purpose will be entertained; and therefore the local authorities who have been hankering after this extravagant way of obtaining a private electric lighting connection have dropped it. In some instances it would have meant a very big thing; and in any case it cannot prove a satisfactory outlet for the ratepayers' money. The various private speculations that have been launched upon this pretence of "free wiring" are not turning out well. The original simple way of putting on an extra ½d. or 1d. per unit of electricity supplied, to pay for the "free wiring," did not answer. It made a dear light still dearer; and consumers generally were not such fools as to swallow the bait offered to them. Now, where the system still persists, an ordinary hiring agreement is in use, the consumer promising to pay something like 6d. per lamp per quarter for the fittings supplied. It is not a very "fat" job for anybody.

The electricity supply accounts of the Edinburgh Corporation are singular. The city makes a great show of arc street lighting, using 741 lamps, which is probably the largest number of any British electricity supply undertaking. These are charged at £14 a year apiece, which, of course, is far below their cost. The difference is admittedly about 33 per cent.; and if depreciation were reckoned, it would be much more. The private consumers have to pay the rest, but as the price charged is only 3½d. per unit, they probably do not mind. We cannot make out that this is a paying price; for the so-called gross profit on revenue account was only £31,000 last year, on an investment of £595,655. Out of this, interest, sinking fund, and reserve or depreciation must be met, which is obviously impossible. It is risky finance, looking very much like catering for temporary popularity at the cost of the future. The Edinburgh Corporation ought to be above this sort of thing, apart from the certainty of a day of reckoning.

KNUDSON ON ELECTROLYSIS OF STREET MAINS.

Notwithstanding what has appeared in the "Journal" in explanation of the attitude assumed by representative gas companies, as the Sheffield United Gas Company, in regard to the troublesome question of the electrolysis of street mains by wandering electric currents, our good contemporary, the "Electrical Review," persists in girding at what it calls "the recent unfortunate decision of the House of Lords Committee." The grumbling against the action in this matter of Professors Perry and Ayrton also continues. We may reasonably leave the broad backs of these eminent scientific gentlemen to bear the not wholly disinterested censure that is being piled upon them by the Editor of the "Electrical Review" and his correspondents, who do not always sign their criticisms, while we now address ourselves to the more important subject of the merits of the decision in the Sheffield case. The treatment of the subject by the "Electrical Review" is particularly unfortunate. This journal commits itself to the assertion that there is not the least ground for apprehension on the score of electrolysis, "so long as ordinary precautions are observed." It is further alleged that to adduce American experiences of electrolysis is "a palpable absurdity," because in America the tramway undertakers have no regulations to comply with, and take *all risks*. [The italics are not ours.] Lastly, it is remarked that, whereas in England the Board of Trade make regulations for the prevention of electrolysis, even when these regulations are obeyed to the letter, the tramway undertakers will *still* be liable for damages! To which the only answer is, "Why, certainly!" Where is the inequality?

Let us take these points *seriatim*, with the object of showing that the English gas companies have not acted in the matter without reason. "There is not the least ground for apprehension on this score, so long as ordinary precautions are observed." What are the "ordinary precautions?" Where have they been adopted, without legal pressure, and have been proved to reduce the risk of electrolysis to the vanishing point? Not in America, admittedly, although there tramway undertakers take *all risks*. If that is their legal position, it is no more than the situation explicitly secured by the action of the Sheffield Gas Company.

But how does it work? Everybody knows the answer to this question. In America electrolysis is rampant, because the street railway companies set off their theoretical liability for all damages by a complete practical indifference to everything that is not brought home to them. As to the third point, who pretends that official regulation discharges the liability of the subject? The Board of Trade regulations are aimed at the prevention of electrolysis; but that does not mean that their intent is to be taken as equivalent to the fact of success.

Our contemporary is altogether illogical in its view of the Board of Trade regulations. "If the precautions required by the Board of Trade are inadequate for the prevention of electrolytic injury, let them be abolished altogether." That is to say, the Building Acts are a dead letter, because new houses occasionally tumble down, which is absurd. Really, the gas companies' position is the logical one, in the circumstances. It does not concern itself with the existence of this or that official regulation, but merely claims that whoever breaks, shall pay. Not to do our contemporary any injustice, however, let it speak for itself once more on the general question. "We repeat that the alleged danger of electrolytic injury is, under existing conditions, a chimera. What we really fear, with only too good grounds, is that, having obtained their clause, the gas and water companies will proceed

Effects of Electrolytic Action on a 48-Inch Main of the Metropolitan Water-Works, Boston (Mass.).

to demand compensation for *all kinds of corrosion*, such as is constantly met with in buried pipes; and the unhappy electrical industry will be compelled to pay for sins of which it is entirely innocent."

It should be sufficient answer to this plea, to beg our electrical friends to abstain from crying out until they are hurt. Gas-mains do not in ordinary circumstances corrode at all. Gas undertakings employ their mains as a necessary means of serving their customers, and are not likely to misuse them as pawns in an unworthy game of litigation for imaginary damages. It is quite a mistake to think that "all kinds of corrosion" are "constantly met with" in this class of a gas company's property. Mains that have been properly laid—a question of fact—will last 100 years in the absence of accidental injury. All that gas and water companies ask is statutory protection in the continued enjoyment of this security of their property, or compensation for its disturbance. The pretended risk of "endless litigation" on this score is really only a bugbear.

That the risk of electrolytic damage to buried pipes is not an imaginary one, will be seen by the accompanying illustrations. They were supplied to Mr. A. A. Knudson, of New York, for a paper read before the New England Water-Works Association. The author is the leading expert in this particular department of electric science; and he kindly sent us a reprint of his paper. His main purpose seems to have been to prove the fact of the escape of electric currents to water-mains, even from well-bonded tramway metals—the "ordinary precaution," probably, of the "Electrical Review." Mr. Knudson spoke of rails so well bonded at the joints that the difference of potential did not exceed 0·003 volt, which may be regarded as pretty close to the conductivity of the rail itself. "A well-bonded track return, therefore, should not be accepted as a cure for electrolysis."

Moreover, acute points of deflection of the current to neighbouring mains are particularly liable to occur at switches and crossings, such as must be found in every city tramway system. The rail chairs are a common cause of introducing the traction current to the subsoil and anything it may contain. The influence of the joints in mains is noticed as an important element in the problem of electrolysis; recent evidence going to show that "the mains are becoming damaged through a use entirely foreign to their true purpose. The shunting of the current round the joints, either through the moist earth on the outside or the water on the inside, owing to the resistance of the joint, is the cause of pitting or softening of the metal on the high potential side. Evidences of this are now detected in every city where the speaker makes investigations."

Mr. Knudson laid stress on the fact that it is often impossible to locate accurately the places where the most damage will occur, and illustrated his remarks with a photograph of a pipe entirely destroyed by electrolysis in Providence. Two excavations, each 25 feet from the point where this pipe was found, showed nothing serious in the way of damage. All these examples of corrosion are true to type. There is no mystery about them. They exhibit the common characteristic of pittings filled with graphite, often on the bell of the pipe. It is not merely a question of the rail joints. "The escape of current to water and gas mains would be bad enough were the mains continuously perfect conductors; as a matter of fact, they are not." Mr. Knudson is specially severe upon the idea that official regulations should ever be accepted as tantamount to prevention or cure of electrolysis, which is the valuation the "Electrical Review" seeks to put upon the Board of Trade regulations. This position is the very thing Mr. Knudson adjures American cities to beware of, because "the effect of such ordinances may be to relieve the railway company from liabilities for future damage, and to throw the responsibility for the cost of any further changes upon the city itself." He, at least, does not think much of paper regulations.

In the discussion which followed the paper, Mr. Dexter Brackett, Engineer of the Distribution Department of the Boston Water-Works, showed the striking photographs here reproduced, of damage to a 48-inch main recently laid under his supervision. These pipes are located in the city of Cambridge; and were laid in September, 1896. The damage occurred at a point 400 feet distant from the power station of the Boston Elevated Railway Company. The line of main extends three and four miles both ways from this particular point. The discovery of the injury was made on Oct. 5 last. The pittings are from $\frac{1}{2}$ to $\frac{3}{8}$ inch deep, after the softened iron has been dug out of them. The distance from the top of the pipe to the bottom of the rail is $14\frac{1}{2}$ inches. The subsoil is a moist gravel. The difference of potential between pipe and rail varies from 5 to 7 volts. The pipe is positive to the rail. The quantity of electricity flowing off from the pipe at this point is about 60 amperes. At a mile away, when two sections of the main were about to be joined up, a connection made between them by means of a No. 8 copper wire showed a flow of current ranging from 80 to 90 amperes. At about a mile in the opposite direction, on the same line, in November, 1899, a temporary electrical connection was made by means of a No. 8 copper wire between two ends of the broken main; and here again a current of 30 to 50 amperes was measured.

The formation of graphite is mentioned by Mr. Knudson as a sure evidence of electrolysis. A perplexing feature in recent investigations is the fact that no reliance is to be placed on the positive or negative signs of various districts. This observation merely means that escaped currents are not under control, but will roam throughout the pipe systems of a city, causing damage at unknown places. Still, Mr. Knudson does not regard the evil as incurable. He declares that "a complete metallic circuit entirely insulated from the earth is the only real remedy. Such a system has been in successful operation for years, overhead or underground, in Cincinnati, New York, Washington, and the District of Columbia. Nothing stands in the way of its general adoption except the hostility of the electric railway companies and their political influence in municipal affairs." Mr. Knudson made the significant admission that not a single judgment against an electric railway company for damages to pipes has yet been delivered in the United States Courts, although several cases are pending. This is the upshot of the companies' taking all risks, which means that the onus of proof of injury would always lie on the complainants.

Mr. John Holmes, who visited this country and America in 1897 in the capacity of New Zealand Government Commissioner, and furnished us at the time with some interesting particulars in regard to the Colony, has been appointed by the Government a Special Organizing Commissioner to make arrangements for the reception and entertainment of their Royal Highnesses the Duke and Duchess of Cornwall and York, who will visit New Zealand in the course of their tour.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1138.)

THE settlement was the chief feature of the week just closed on the Stock Exchange; and it was negotiated without any difficulty. But next to it came the new issue of Consols, the immense success of which had a beneficial and far-reaching effect. A cheerful disposition prevailed generally, coupled with hopeful anticipations regarding business in the near future. Prices for the most part show an advance, especially in railways, under the influence of bright weather and cheaper coal. A conspicuous exception was furnished by Consols, which were, as a matter of course, strongly affected by the new issue; and on Friday they were actually done once at 93⅞—a record low price for many a year. In the Money Market, there was great scarcity at first, owing to the lock-up of Consols' application deposits; but as soon as these began to be released, the stress was removed, and the tendency is now the other way. Business in the Gas Market was fairly active on the whole; but once more a large number of issues were quite let alone, and by far the greater proportion of transactions were recorded in the stocks of the Gaslight and Coke Company. The general tendency was very good, and considerable advances were made in some leading quotations; while, on the other hand, none showed a relapse. Gaslight ordinary was in good form—opening at 93¼, and closing at 95¼, with steady business pretty well every day, and the quotation rising 1½. The secured issues were unusually active, and all were firm, while the debenture advanced a point. South Metropolitan was not extensively dealt in; but it was full of buoyancy, and towards the end of the week it rose rapidly, and closed with four points to the good. Nothing at all was done in Commercials. The Suburban and Provincial group were extremely quiet—hardly any business being done in them at all, but some noteworthy movements took place. Crystal Palace rose five points, but without any actual transactions being marked in it; thus making a large advance towards a recovery of the exceptionally choice position it used to hold in the market. British was a little stronger. There was rather more doing in the Continental companies, especially Union, which changed hands at top prices, but could not improve upon them. Imperial, however, had a rise of three points. Among the rest, Australian bonds and River Plate advanced. Bombay reports a good year's business, and an intention to pay a dividend higher by ½ per cent. The Water Companies were quiet and steady; the only move being a slight advance in Southwark.

The daily operations were: Moderate business on Monday, with a rise of 2 in Australian and 1 in Imperial. Business about the same on Tuesday; Imperial gaining 2, and Gaslight ordinary 1. Wednesday was quiet. Crystal Palace rose 3, and South Metropolitan 2. Thursday was more active. Crystal Palace rose 2, Gaslight debenture 1, and ditto ordinary ½. Friday was quieter. South Metropolitan rose 1, and British ½. On Saturday, South Metropolitan gained 1 more.

Additional Paper for the Institution Meeting.—In addition to the papers to be read at the meeting of the Institution of Gas Engineers this week which have been already noticed, one entitled "Some Notes on the Conditions which Prevail within a Carburetted Water-Gas Plant," will be read by Mr. W. J. Atkinson Butterfield, M.A., F.I.C., of which the following is a synopsis: The reactions in the generator of a carburetted water-gas plant during (*a*) the "run," (*b*) the "blow." The quality of gas formed at different minutes of the "run." Can the "run" be extended beyond the usual time without detriment to the quality of the gas made? The products of the "blow." Comparison of the products of the "blow" in the Lowe type of generator with those of the Dellwik generator. The proportions of the heating value of the fuel consumed during the blow utilized (*a*) in raising the heat of the fuel bed, and (*b*) in gasifying the oil and fixing the gas. Can the "blow" be shortened without sacrifice of efficiency? The proportion of heating value of the fuel consumed which is now lost. To what extent can it be made available in the plant?

Estimation of Arsenic in Coke.—In a paper read before the Nottingham Section of the Society of Chemical Industry on Wednesday last, by Messrs. L. Archbutt, F.I.C., and P. G. Jackson, F.I.C., the authors—after referring to the great difficulty of accurately estimating minute quantities of arsenic in a substance like coke—described the method that they have employed after numerous experiments, which is briefly as follows: 50 grammes of the dry coke, finely ground and sifted, are digested, for at least two hours, at the boiling temperature, with 100 c.c. of pure nitric acid of 1·42 sp. gr. in a plain glass retort, with the neck inclined upwards, so as to condense and return the acid which evaporates. The liquid is diluted with water, filtered, and evaporated with 25 c.c. of pure concentrated sulphuric acid until every trace of nitric acid has been got rid of. The residue is dissolved in water (total value 100 c.c.), mixed with 23 grammes of purified sodium chloride and 2 grammes of ferrous sulphate, and distilled until the temperature reaches 150° C. Pure zinc sulphide is added to the distillate, which precipitates all the arsenic as sulphide; and this is filtered off and boiled with water until decomposed. The solution is concentrated to about 40 c.c., made quite cold, mixed with sodium bicarbonate in excess, and titrated with centinormal iodine solution. The authors called attention to the fact—important to gas managers and maltsters—that, in burning coke, a very considerable proportion of the arsenic remains in the ash.

THE WATER SUPPLY OF NEW YORK.

THE very serious water famine from which New York City has recently been suffering, calls attention, in a pointed fashion, to the position of affairs there in regard to the present and future supply of water. A brief *résumé* of the past history of the question, which has from time to time cropped up in the pages of the "JOURNAL," and a statement of how matters stand at the present moment, will not therefore be wanting in interest.

Materials from which to readily sketch that past history and the present situation are afforded by two interesting articles that appeared in "Municipal Affairs" (the organ of the Reform Club, Committee on City Affairs, of New York) for March and September of last year. The first is a chapter on Water Supply, contained in a series of articles entitled the "History of Public Franchises in New York City," by Gustavus Myers; the second is a paper by M. N. Baker (a consulting engineer) on the "Water Supply of Greater New York." Those who wish to study the subject in detail, may be recommended to obtain these two numbers of the periodical referred to above, which is published in England by Messrs. P. S. King and Son. The following is an outline of the story therein told.

At the end of the Eighteenth Century, the inhabitants of New York relied upon wells for practically the whole of their water requirements. The first body to undertake to supply the city with water was Aaron Burr's Manhattan Company. When it is stated that this Company, though formed ostensibly for supplying water, was really intended to transact banking business, which an apparently innocent section in its charter enabled it to do—to the complete surprise of the political party in power, who had previously owned, and run to their own advantage, the only bank in New York—it will be readily understood that it did not afford complete satisfaction in regard to its water business; the supply often failing for weeks together in winter time. It is interesting to note that, although long since superseded by the Croton water supply, the Manhattan Company retains, enclosed in a building at the corner of Centre and Reade Streets, its original reservoir, in order to keep alive its banking privileges.

The dangers arising from this lack of water led to various proposals for the establishing of a supply by the city. One of these was to dam the Hudson, and convert its salt water into fresh! Inefficiency and corruption had, however, so involved the city into debt, that nothing was done until an epidemic of cholera, in 1832, "so devastated the city that grass grew in deserted streets, once the busiest." In February, 1833, the Croton Water Bill was passed; and in May, 1834, the building of the Croton dam, the aqueduct, High Bridge, and the reservoirs was authorized. Opposition to the carrying out of the Croton scheme was finally broken down by a great fire, which, in 1835, destroyed over $20,000,000 worth of property.

The construction of the aqueduct was begun in May, 1837; and water was first turned into the Fifth Avenue distributing reservoir (since abolished) on July 4, 1842. The Croton system cost about $9,000,000. The supply so provided naturally proved inadequate to meet the requirements of a rapidly growing population. Prior to 1870, there were practically no storage reservoirs. In that year, the outlets of several small lakes were dammed up, and of another in each of the years 1873 and 1878. A new aqueduct was begun in 1885, and finished in 1890; while various reservoirs have since been, or are being, constructed. The total outlay up to the middle of 1899 was nearly $40,000,000; and the storage reservoirs had in that year a total capacity of 40,500 million gallons. A new—the Jerome Park—reservoir is at present under construction, and is estimated to cost nearly $5,500,000; while the new Croton dam will cost about $4,150,000. By an Act of 1893, an annual expenditure of $500,000 for the acquisition of land, water rights, &c., necessary for the prevention of pollution, was authorized.

So far as the borough of the Bronx is concerned, a large part of that area has, since 1873, been supplied by the New York and Westchester Water Company, a private Corporation whose rights do not expire until 1905. This Company obtained its powers in the crooked way so familiar to students of American municipal politics. The contract was apparently one merely for the supply of Hart's Island, but was so worded that it actually gave the Company the right to lay its mains and pipes "in every street, avenue, and thoroughfare in the then or future city of New York." Its service has been "entirely inadequate;" and there would have been a water famine long ago had not the City Authorities furnished the Company with 500,000 gallons per day at a charge of only 1 c. per 100 gallons. "Commissioner Dalton declares that the existence of this Company's franchise and contracts is a serious obstacle to the extension of the city's service in the Bronx district. It is generally believed," says Mr. Myers, "that the New York and Westchester Water Company is not only willing to sell out to the city, but is coyly inviting an offer. Louis F. Haffen, the President of the borough of the Bronx, has stated that the Company is not only bankrupt and its plant valueless, but that it is retailing the water furnished by the city at an advance of 100 per cent."

What really roused the citizens of New York to a consideration of the facts concerning their water supply, however, was the attempt made, in August, 1899, by the Ramapo Water Company to negotiate a contract with the city, whereby the Company were to be paid $200,000,000, in annual instalments of about $5,000,000,

in return for which they were to supply the city with not less than 200 million gallons a day at $70 per million, or (say) 3½d. per 1000 gallons. This Company was incorporated by charter in 1895; and the Bill conferring the charter was so amended (in favour of the promoters) that, in its final shape, "it gave absolute rights of condemnation in any watershed in the State; it empowered the Company to lay pipes under all navigable waters, and to supply water to any community in the State. These extraordinary powers, which had never before been given to any similar corporation, and which were to last for forty years, enable the Company to stand in the way of any rival seeking to supply New York or Brooklyn with water. The Company to whom these grants were made, had assets, according to the affidavit of its President on Feb. 2, 1897, 'of at least the value of $5000;' yet it asserted its ability to supply 200 million gallons of water daily—the supply to begin in 1902."

The Commissioner of Water Supply appears to have been willing to sign this contract with the Company, and the Board of Public Improvements to sanction his so doing; but the proposal aroused the most vehement opposition, and several injunctions were obtained from the Courts, restraining the Board from proceeding in the matter. The annulment of the Ramapo Company's charter has been also called for, mass meetings have been held, and a Citizens' Vigilance Committee appointed.

Attention was specially directed to the fact that, although the Commissioner of Water Supply was then willing to sign the Ramapo contract, on the ground of New York's water resources being inadequate, a report, drawn up some time previously, by the same official, but only just then published, showed that, "in the months of January, February, and March, 1899, the rainfall was sufficient to fill all the reservoirs of the Croton water system, and that after the reservoirs were full, the water ran to waste over the Croton dam at the rate of 680 million gallons a day; while the city's consumption of water was about 260 million gallons daily. In other words, nearly twice as much water as the city could use was allowed to run to waste. . . . The sudden conversion of the Commissioner of Public Supplies, which led him to recommend the Ramapo scheme to the Board of Public Improvements after he had penned this report, was widely and pertinently commented upon."

The Company struggled hard to get their contract ratified. They declared that their project was only undertaken in response to a public demand "as expressed in memorials from fire insurance and other bodies," that New York's water supply was deficient in quantity and pressure, and was altogether unable to cope with a serious fire. They did not gain much by this appeal to the public nerves. "The President of one large fire insurance company, a member of the New York Board of Fire Underwriters, declared the statements sheer impertinence on the part of the Ramapo 'ring.' 'It is an attempt,' he said, 'to connect the name of a reputable organization with one of the biggest pieces of robbery ever devised. . . This Ramapo contract is a steal of the first magnitude.'" In face of the opposition raised—it will be seen that the opponents of the scheme did not waste any compliments on it—the Company remembered that discretion is sometimes the better part of valour, and retired (at any rate for the time being) from the contest.

On Aug. 31, 1899, the Municipal Assembly duly passed a resolution which ended by declaring that: "It is not in the public interest, nor for the public weal, nor is it necessary, that the city should contract with a private Corporation for its supply of water; that, upon the expiration of the existing contracts for such purpose, proceedings should be taken to acquire the rights of the persons or Corporations holding or owning any such rights, to the end that the Municipality shall own its own water system exclusively." The struggle between the citizens and the Company had the further result of investigations being made into the question of the water requirements and resources of New York by two different authorities. The first was undertaken on the instructions of Comptroller B. S. Coler, the most prominent opponent of the Ramapo scheme; and the second by order of the Merchants' Association of New York. The reports, drawn up by the engineers employed, have both been published; and with the facts and propositions therein set forth, we must deal in a subsequent article.

Guides to the Patent Office Library.—The acknowledged utility of this library is being greatly enhanced by the publication of a series of small handbooks, compiled, under the supervision of the Comptroller-General of Patents (Mr. C. N. Dalton, C.B.), with the object of assisting those who are desirous of utilizing the stores of information to be found upon its shelves. The first of these little books, of which four have appeared, is a key to the classification of French patent specifications; the second and third are subject lists of matters relating to photography and the laws of industrial property and copyright; and the fourth is a guide to the Search Department. One of the last issued has been forwarded to us. It indicates the publications in which grants of patents and registrations of trade marks and designs are recorded, and the periods for which the grants were made. The information collected is arranged under the names of countries; and it is followed by a valuable dictionary of "trade" or "fancy" words occurring in specifications, and indicating where they are to be found. These useful little books are sold at the Patent Office at 6d. each.

PERSONAL.

Mr. W. Sperring, of Weymouth, has been appointed Manager of the Oxted (Surrey) Gas-Works.

Mr. Daniel Hinchcliff, the Surveyor to the Dorchester Urban District Council, and formerly of Pudsey, was last week appointed Surveyor and Water-Works Engineer to the Northallerton Urban District Council.

At the meeting of the Institution of Civil Engineers last Tuesday, Mr. W. R. Herring, Gas Engineer to the Edinburgh and Leith Gas Commissioners, and President of the Institution of Gas Engineers, was elected a member.

An advertisement (No. 3669) recently appeared in our columns asking for applications for an appointment as Manager of a small Leicestershire Gas-Works. The position—at Earl Shilton—has now been filled by the selection of Mr. Albert A. Lee, of the Eccleshill Gas-Works, near Bradford.

In the "Journal" for the 19th ult., it was announced that Mr. Hubert Russell, of Holmfirth, had been appointed Gas and Water Engineer to the Newton-in-Makerfield Urban District Council, in succession to Mr. D. H. Lloyd. We learn that Mr. Russell has since declined the position in deference to the wishes of his Directors, who have offered him a substantial inducement to remain in their service.

Mr. Richard W. Parris, of the Wolverhampton Gas Company's staff, who is leaving England on Saturday next to take up an appointment under the Cape Town Gas Company, was last Tuesday presented with a travelling case by his fellow officers. The presentation was made by the Secretary (Mr. A. Jones), who, on behalf of the staff, wished Mr. Parris every success. Mr. Parris suitably returned thanks, and remarked that in leaving he felt that he had the kindly feelings and goodwill of all, and much appreciated the token of regard they had presented to him.

In moving, in the Liverpool City Council last Wednesday, an addition of £200 a year to the salary of Mr. Joseph Parry, the Water Engineer, Alderman Burgess mentioned that Mr. Parry had now been in the service of the Corporation for nearly forty years. Since 1898 the revenue of the Water Committee had increased by no less a sum than £34,700; while the expenditure had decreased by £1511 a year. The estimated population outside the city supplied with water was no fewer than 330,000; and the revenue amounted to £12,000 a year, and was increasing every year. The recommendation was agreed to.

OBITUARY.

The death is announced of Mr. H. A. Rowland, Professor of Physics at the Johns Hopkins University, Baltimore, U.S.A.

The death occurred on the 24th inst. of Mr. James Newton, of George Newton, Limited, Prince of Wales Meter-Works, Oldham. No change will, however, be made in the style of the firm.

We regret to announce the recent death, as the result of an attack of pneumonia, of Mr. William Santo Crimp, M.Inst.C.E., whose name was well known in connection with water engineering and sewer construction work. He was at one time Engineer to the Wimbledon Local Board; and a few years ago he became associated with Messrs. Taylor and Sons, of Westminster. He was called in to advise the authorities of Bombay on the subject of checking the waste of water in the city; and his report was noticed in the "Journal" early last year. Deceased was in his 48th year.

The death occurred early this month, at his residence in Bonn, of Herrmann Schumm, the Managing and Technical Director of the parent Otto Company, at Deutz. He was one of the engineers commissioned by Dr. Otto to work out the mechanical details, and settle the standard design, of his invention prior to its being placed on the market. Towards the close of 1877, Herr Schumm went to Philadelphia, and assisted in the pioneer work then going on for the introduction of gas power. He there established the well-known firm of Schleicher, Schumm, and Co., which was incorporated in 1894 under the name of the Otto Gas-Engine Works. Shortly after his return to Europe, Herr Schumm took up his residence in Paris, and erected extensive works for the Parisian Otto Company, and for some other affiliated enterprises; remaining in charge of their management for three years. In 1882, he was appointed Technical Director of the Deutz Company; and under his supervision not only the largest gas-engines for furnace and producer gas now made were developed, but also an infinite variety of designs adapted for a large number of uses. Deceased was about sixty years of age.

Intensified Gas for Lighthouses.—Mr. John R. Wigham recently wrote to the Dublin Port and Docks Board, calling their attention to the advantages of the intensified gas system; and at the meeting of that body on Thursday last, the Engineer (Mr. J. P. Griffith) presented a report on the matter. He said he could not recommend the Board to incur the outlay which the application of the system for improving the lighting of the quays and sheds would entail; but they might try it at Poolbeg Lighthouse at a very small cost, as there they made their own gas, and practically the only alterations necessary would be a change of burners and an additional load on the holders. The Engineer's suggestions were approved of.

COMMUNICATED ARTICLE.

ÉDOUARD DELAMARE-DEBOUTTEVILLE.

A Memoir.

By Bryan Donkin, M.Inst.C.E., &c.

The announcement of the death of M. Édouard Delamare-Debouteville has caused much surprise and grief to the scientific and industrial world, and to the many friends who were endeared to him by his goodness of heart. All who approached him were captivated by his amiable simplicity; and although he had studied and mastered the most abstruse questions, he was always modest and affable. Who would have thought a few months ago that this noble intellect, this open and candid nature, would be carried off from among his fellow-men in the very prime of life?

M. Delamare-Debouteville was only forty-five years of age. But the arduous labours to which he devoted himself, and the amount of work he accomplished, had exhausted him; and the death of his eldest daughter three months ago gave him a shock from which he never recovered. Not being strong, he was unable to resist the malady which assailed him, and to which he succumbed in a few days. He died on the 17th of February, at his house at Fontaine-le-Bourg, near Rouen, in France.

Born on Feb. 8, 1856, M. Delamare came of a commercial family, who had long occupied a distinguished position in the province of Seine-Inférieure. His father, a Chevalier of the Légion d'Honneur, was one of the most noted cotton manufacturers in France. Brought up in a business circle, in which he was continually hearing industrial questions discussed, Édouard Delamare early showed a pronounced taste for mechanics. On entering the École Industrielle at Rouen, he at once took a high place among his comrades; and the Director of the School considered him one of the most promising pupils he had ever had.

At the age of twenty he entered the cotton factory, then directed by his elder brother, who had succeeded his father in the business; and he immediately gave proof of his great aptitude for mechanical science by introducing various improvements in the works. One of his first inventions was a "Universal Tool" for effecting all kinds of work and repairs in the mill—in place of the various cumbrous machine-tools then used. The distance of the mill at Fontaine-le-Bourg from any railway station drew his attention to the question of road-traction, and caused him to study gas, oil, and other engines for driving motor-cars. In 1883, when bicycles first made their appearance, he invented the first tricycle driven by gas which was worked on a road; and his name appears in the book of the Automobile Club as the inventor of the first type of self-propelled carriages.

From this time (1884), he devoted all his attention to gas-engines, and began a series of laborious studies which ultimately bore fruit in the evolution of the "Simplex" engine. He took up the development of the gas-engine at the point where it had been left by his predecessors, Lenoir and Otto. Retaining the Beau-de-Rochas four-cycle, he effected various improvements, the result of which facilitated the construction of much larger engines than those hitherto made. The chief novelty he introduced was the ignition of the gaseous mixture by an electric spark continuously generated, by which the charge was fired with much greater certainty than with an open flame or incandescent tube. The richness of the gas could also be considerably reduced, without the danger of missfires. The admission and discharge of the mixture of gas and air by a slide-valve—a method then much in favour—was a serious obstacle to any attempt to increase the size of the engine. If made for higher powers, it was necessary to have the slide-valve of such large dimensions that the difficulties of working and lubricating it were almost insurmountable. By a special arrangement, M. Delamare was able greatly to reduce the size of this valve. Starting gas-engines—which, till then, was done by turning the flywheel by hand—was another trouble scarcely overcome by the use of an auxiliary motor. M. Delamare was the first to adopt a method of automatic starting, by charging the motor cylinder previously with an explosive mixture, which when fired electrically gave a sufficient impetus to the engine to make it work afterwards in the usual way.

It was with gas-engines thus modified that M. Delamare was able, at Rouen, to utilize cheap or power gas, made in Dowson producers, to drive his engines. He showed a 100-horse power single-cylinder Simplex engine worked with poor gas, at the Paris Exhibition of 1889, which caused a great sensation, and for which he obtained a gold medal. Since that time the gas-engine has entered into definite competition with the steam-engine. It is now no longer confined to small powers for industrial purposes, but has a free field in which the numerous applications of which it is capable can be developed. The economic advantages of gas-engines driven with cheap power gas (as shown by the Simplex) were so evident, that inventors and makers concentrated all their efforts in this direction. M. Delamare next turned his attention to improvements in the gas-producer. He gave up the Dowson system, which necessitated the use of a small steam-boiler, and adopted the Lencauchez method. He designed a producer plant in which the steam was provided by utilizing the radiating heat from the furnace, and the air-blast by means of a fan. An engine driven with power gas gave at that time an average economy in fuel of 30 to 40 per cent., as compared with good steam-engines and boilers. The gain now is upwards of 50 per cent.

After many years of study, labour, and improvements, M. Delamare produced the Simplex engine for which he received the cross of the Legion of Honour at the Rouen Exhibition of 1896. For several years, in conjunction with M. Malandin, he superintended the making of his gas-engines by the Maison Matter at Rouen, and took out more than seventy patents in France and elsewhere. The Société Cockerill, of Seraing, Belgium, negotiated with him in 1895 for the construction of the engine. The terms they offered were accepted; and it is due to the co-operation of this eminent firm, that his engine has at last obtained that well-deserved reputation which it now enjoys.

Having regard to the very great advantages to be realized by the direct utilization of blast-furnace gases, having a heating value of about 110 B.T.U. per cubic foot, in a gas-engine cylinder, the Société Cockerill proposed to M. Delamare to adapt his engine for this purpose. From that time he devoted all his energies to this problem; and with the aid of the engineers of the firm, he succeeded in getting, first of all, an 8-horse power, then a 200-horse power, and lately a 700-horse power engine successively to work with the gases from their high furnaces. It was a revolution in metallurgical science; and the reports of Professor Hubert, Mining Engineer at Liège, and of Professor A. Witz, at Lille, show the importance of this new departure in engineering. By its means, metallurgical foundries and iron-works will have at their disposal a great store of power produced by gases which have been very imperfectly utilized till now. A single cylinder Delamare-Debouteville and Cockerill engine of 700-horse power, driven with blast-furnace gases, and working an air-blowing cylinder direct, was shown at the Paris Exhibition last year. This method of utilizing the power generated was at once adopted; but how many more are awaiting development, to turn this vast store of gas into useful work? The important results obtained by M. Delamare did not escape the notice of the great French industrial firms; and MM. Schneider and Cie., and the French and Alsatian Sociétés de Constructions Mécaniques have taken up the Delamare patent.

At different exhibitions, M. Delamare obtained seven gold medals, three honour diplomas, one grand prix, and the Chicago award for gas-engines. At the Paris Exhibition of 1900, he received the Grand Prix in conjunction with Cockerills. In 1896, he became a member of the Rouen Exhibition, and President of the General Mechanical Section. In 1889, the English Institution of Mechanical Engineers conferred upon him the honour of reading a paper on his gas-engine at the summer meeting held that year in Paris, and attended by many English and foreign engineers. At the present time, some seventy Simplex single-cylinder gas-engines for high furnace gases are at work, or are being constructed, in sizes from 100 to 600 horse power.

Édouard Delamare did not devote the whole of his time to engineering studies, but was a learned man in the general acceptance of the term. His active spirit and his love of Nature led him to the pursuit of natural history; and his labours in this branch of science were greatly appreciated by Dr. Pennetier, the Director of the Rouen Natural History Museum, with whom he was a zealous co-worker. He undertook several journeys in order to increase the collections in the Museum; and the greater part of the local ornithological collections are due to him. His name occupies an honourable place among the principal donors to the Museum. He was also well versed in all matters relating to marine fishing, and gave much attention to the cultivation of oysters. At the International Congress of Marine Fishing at Dieppe in 1898, he read a paper, which was well and deservedly noticed. At Prat, in Finisterre (Brittany), he established oyster parks, which are now in full work; and their produce is much sought after.

Édouard Delamare was a charming conversationalist, a thinker always attracted by the noblest problems, a philosopher well acquainted with all the most modern currents of thought. His life was a striking proof of what may be achieved by thorough and methodical habits of work. His incessant desire for knowledge drove him to study Sanskrit, and for five years he retained the services of a Brahmin Pundit, who came to the Paris Exhibition in 1878, to interpret the Hindoo manuscripts. This Brahmin was astonished at the rapidity of his progress; and his death alone prevented the publication of important works, the result of many years' deep study of the Vedas (the sacred writings of the Hindoos). It was one of his day-dreams to go to India, and there to pursue his interesting investigations into the origin of languages.

It is impossible not to lament his death, and to deplore the tragic fate of one so gifted, snatched away when he had just emerged from the cares and troubles of a laborious life, and was

about to enjoy the fruits of his work. Latterly he travelled much on the Continent, and really overtaxed his physical and mental powers. The writer had the pleasure of his personal acquaintance for several years, and always gained much from his conversation, both in French and English. For some of the above facts he is indebted to M. Kraft *fils*, one of the engineers of the Cockerill firm. M. Delamare leaves a widow and several children to mourn his loss. The accompanying portrait is from a photograph recently taken.

NOTES.

The Working Value of the Sun's Heat.

Mr. J. Y. Buchanan has described in "Nature" a calorimeter designed by himself, and used in Egypt, to ascertain the amount of heat which can be collected from the sun's rays at or near the sea level, and utilized under favourable conditions. The instrument measures the sun's heat in the same way as the calorific power of fuels is usually determined—namely, by the quantity of boiling water which a given quantity of it can transform into steam of the same temperature in a given time. The arrangement consists of a reflector which concentrates the solar heat upon a tube boiler placed in its focus. Starting cold, the water boils in about 40 seconds. The experiments were carried out at Sohag, on the Nile. Here, with a motionless atmosphere, the shade temperature was 106° Fahr. The result of the observation was to prove that the working value of the vertical sun's rays as collected by the calorimeter is about 1-horse power per square metre of the earth's surface.

The Gas Power Electric Lighting Engines at Belfast.

In the course of some correspondence published in "Engineering" on large gas-engines, it incidentally transpired why the Belfast electric lighting, originally done under the designs of Professor Kennedy by gas power, was subsequently worked by steam. Mr. J. W. Hartley and Professor Henry Robinson have been discussing the performance of the Belfast gas-engines, which were supplied by the town's gas; and it is agreed that their rate of consumption was high. This was due to the low initial compression adopted, says Mr. Hartley, in order that the engines might be depended upon to run successfully in parallel. Steadiness of running was the one thing aimed at; and with this object, high economy was deliberately sacrificed. It so happened, however, that the engines gave trouble in another way; weak charges failing to ignite, and exhaust-pipe explosions being frequent. These were a great source of annoyance in the crowded district surrounding the central station; so that at one time it looked as if the installation would have to be abandoned on this account. The evil was cured, however, by Mr. M'Cowen. The gas consumption tests satisfied the demands of the specification. What settled the gas-power scheme was the refusal of the Gas Department to supply the station at a lower price than that charged throughout the city—namely, 1s. 10d. per 1000 cubic feet. Consequently, enlargements were met by providing steam power; and this proved so much more economical that the gas-engines were dispensed with. If the gas had been supplied at 1s. per 1000 cubic feet, as Mr. Hartley thinks it ought to have been, the gas-engines would probably have been retained in service.

Combustible Gases in the Atmosphere.

M. Armand Gautier, Professor of Chemistry at the Ecole de Médicine, Paris, has for many years been occupied in researches on the combustible gases of the atmosphere. These investigations have been carried out with extraordinary care and completeness, and have yielded results of much interest. The most striking fact elicited by M. Gautier is that pure air contains free hydrogen as a normal constituent to the extent of about two volumes in 10,000. The method of analysis consisted in aspirating a large volume of air through a train of absorbents; the difficulty of the investigation consisting more in the minute quantities of the gases recovered than in the character of the experiments. As regards the carbon dioxide, M. Gautier testifies to the difficulty of completely absorbing this gas from a large bulk of other gases. He found barium hydrate to be the quickest and most complete absorbent. This reagent would, of course, also absorb other acid gases. For the absorption of minute traces of carbon monoxide, the ordinary reagents are ineffective, and a new one was found in iodine pentoxide. Air containing 1-100,000th of the gas loses it completely and at once when passed over the pentoxide heated to 70° C. Other gases have no action on the oxide at this temperature. When carbon monoxide acts upon iodine pentoxide, iodine and carbon dioxide are produced. The former is absorbed by a tube containing finely divided copper, and the carbon dioxide by barium hydrate. Taking the air of Paris as an example, M. Gautier finds that its content of combustible gases, in volumes per 100,000, may be stated as follows: Free hydrogen 19·4, methane 12·1, benzene vapour or analogous compounds 1·7, and carbon monoxide and traces of olefines and acetylene 0·2.

A Curious Syphon Pipe.

An interesting account, which is suggestive in many respects, of a successful syphon pipe was given lately by Mr. Robert S. Hale to the Boston Society of Civil Engineers. The problem to be solved was that of bringing the water of a hill tarn down to a few houses 350 feet below it, but crossing an intervening ridge about 200 feet wide, and rising to a height of 12 feet above the surface level of the pond. The job was required to be done as cheaply as possible, as the houses were only a summer settlement. The first attempt was a line of 2-inch galvanized iron pipe, with screwed joints, laid over the ridge. This syphoned the water over the ridge, and would work satisfactorily for a few hours, when the flow would stop. The only possible cure was to open a waste-cock on the pipe, about 200 feet below the crest of the ridge. This kept the syphon working; but it wasted the water excessively, and reduced the available pressure at the houses. Various devices were tried, including a foot valve at the inlet, making an air vent on the delivery side, taping and tarring the joints. Nothing answered for long; and in the end it was decided by a Committee of Engineers who took the matter in hand to lay a lead pipe, with wiped joints, alongside the old iron pipe. It was ascertained that all the trouble arose through indraught of air at the joints of the pipe, which destroyed the syphon. A connection was made between the long leg of the lead syphon, near the bottom, and the old iron pipe, which was cut at the top at a point about midway between the water level in the pond and the summit of the syphon. This was to get rid of the entrained air bubbles which occasionally came over. The record is significant of the difficulty of making an iron pipe thoroughly gas tight.

Catalytic Sulphuric Acid.

It is reported by Mr. A. Haller that the Badische Anilin und Soda Fabrik have succeeded in making sulphuric acid of all grades by the catalytic method. Many attempts have been made to achieve this operation; the first being credited to Mr. P. Phillips, of Bristol, so long ago as 1831. None of these endeavours were crowned with financial success, however; but the records of their failure have served to guide the proceedings of the Badische firm. In principle, the catalytic process of sulphuric acid formation consists in subjecting a mixture of SO_2 and air to the action of spongy platinum. The former compound then oxidizes one step further, to SO_3, or sulphuric anhydride, which, being absorbed by water, constitutes sulphuric acid. In the early experiments in this direction, it was found that the spongy platinum used very quickly lost its activity, as the metal does in so many other operations. The efficiency of the process was consequently low, and a large proportion of the sulphuric anhydride formed became dissociated. The Badische Company have now overcome these defects. The degeneration of the catalytic power of the spongy platinum was traced to the presence of impurities in the sulphurous acid, especially in the matter of arsenic compounds; and accordingly the gas was completely purified before contact with the platinum. This appears to have got rid of the trouble. The dissociation of the sulphuric anhydride after its formation is prevented by careful regulation of the temperature, which, while it must be high enough to ensure the union of the sulphurous acid and oxygen, must not rise above the dissociation point of the sulphuric acid. It is stated that the production of concentrated acid is cheaper by this method than by the lead-chamber process; while the lower grades of acid are made at least as cheaply, and the capital outlay is only two-thirds of that required for a lead-chamber plant.

An Example of Natural Ventilation.

An interesting example of the successful ventilation of a gas-lighted dining or assembly room is given in the apartment illustrated in the accompanying sectional drawing by Mr. Arthur Rigg, whose Society of Arts paper on ventilation of January, 1900, was noticed in the "JOURNAL" at the time. Mr. Rigg's communication was in the form of a letter to the "Engineer." The writer believes in inlet ventilation, and accepts the principle that fresh air in abundance should be introduced into the upper parts of a room, and that the vitiated air should be discharged from below. He declares, however, that in practice it is not at all necessary, as a rule, to provide special outlets for foul air from living rooms; because the cracks and crannies in window frames, under doors, including the permeability of modern brick walls (and the fire-places?), will generally be found sufficient. Accordingly, he ventilated the room here illustrated in the manner indicated. The sketch shows one of a suite of rooms recently erected at the Royal Botanic Society's Gardens, Regent's Park. It measures 30 ft. by 45 ft. The ceiling is quite tight, nor is there any mechanical extraction. Advantage was taken of the rooms running north and south, with prevailing winds east and west. Inlets were made on each side; and experience shows that in winter a current can always be relied upon to send in a good supply of fresh, cool air, which is scattered and deflected upwards, as shown by the arrows, thus mixing with warmer air already in the upper part of the room. The dining-room, or ball-room, has ten such inlets, five on each side, while the drawing-room, library, and café have similar inlets in proportion to their capacity. These inlet deflectors are differently proportioned to those usually employed, inasmuch as the outer end, which is protected by a grating, is larger than the inner. Usually, such openings are tapered in the opposite way, with the larger end towards the room; but this has the bad effect of destroying all the initial velocity of the air currents. So that, instead of mixing with the warmer air, they become a cold douche, falling like a solid upon the heads of people sitting below. In Mr. Rigg's new method, the draughts are directed upwards, where there is nobody to complain; whereas the "Tobin" and other systems generally pour their unmixed supply of cold air downwards, where everybody complains. In warm weather, the windows are also opened.

TECHNICAL RECORD.

MODERN GAS PRACTICE.

The paper by Mr. H. E. Jones on this subject, which was read at the Meeting of the Institution of Civil Engineers on the 16th inst., was (as readers will have gathered from the epitomized notice of its contents in our last issue) one which lent itself to a roving discussion; and consequently the remnant of the sitting at the close of its reading only sufficed for an expression of the views of three speakers. Further discussion had therefore to be postponed to last Tuesday's meeting; and then the whole of the time (excepting a brief portion which was devoted to formal matters) was given up to this one subject. The debate was smartly sustained, though some of the speakers were disposed to be a little loquacious. But each and all, it may be said, had some good point to bring forward—whether generally acceptable or not is another matter. The following does not pretend to be a report of the discussion, but may be taken as merely an indication of the trend of the speakers' remarks.

At the conclusion of the reading of the paper by Dr. Tudsbery (whose delivery was admirably clear), Mr. Jones opened the discussion with a remark or two, in which he urged very strongly the claims of the engineer to be recognized as the most potent factor in ensuring a really cheap supply of gas. Then Mr. C. E. Brackenbury was called upon. He reminded those present of the paper that Mr. Charles Hunt contributed to the Institution seven years ago, and which paper, he observed, covered a good deal of the ground over which Mr. Jones had now travelled. The speaker appeared to have some doubts whether the author had given a complete impression of modern practice in the manufacture of gas at the present day. He criticized the general arrangement of the paper; and then, to justify his former statement, he pointed to certain omissions. He complained that no mention was made, except incidentally, of those works where the whole of the operations of receiving coal to the selling of the residual coke are performed by automatic means; and it would have been interesting, he said, if the author had shown the complete cycle of operations. Then the successful conveying of hot coke as it came from the retorts was ignored. Mention of the modern practice of replacing high and bulky plant by low and compact plant was omitted; and in this connection he noticed Mr. Jones's preference for the original high coke scrubbers. Again, no reference was made to gas-exhausters, though within the last ten years Mr. Bryan Donkin had greatly improved the capacity, and increased the efficiency, of these machines. In connection with the water-gas process, the Dellwik system, and possible developments, might well have been referred to. When treating of gasholders, the Gadd and Mason spiral holders, and the Pease wire-rope system of guiding, should not have passed unnoticed. The Company with which he (Mr. Brackenbury) was connected recently erected a gasholder on the Gadd and Mason system. It had a capacity approaching a million cubic feet, a diameter of 150 feet, and was of three lifts. It had been so successful that they were going to duplicate it in the near future. In the speaker's view, the author had claimed too much for the sliding-scale legislation. His statements might give the impression that more improvements were due to that legislation than probably was the true state of the case. In his own opinion, labour troubles had had a far greater part in making gas companies adopt mechanical methods; and the competition of the electric light had instigated gas engineers to find the best means of handling their material and of producing cheap illuminating gas. The mention of direct-acting steam stoking-machines might lead some to suppose that this system of operating them was still to be found pretty generally in gas-works. This, however, was not the case. There were many objections to it; and it was only found in isolated instances. Machines actuated by hydraulic power and compressed air were now almost exclusively used. In the cartoons exhibited, the machines shown were of the Arrol-Foulis type, driven by hydraulic power. It would have added interest if the author had shown the compressed-air machine which had been brought to a great state of perfection by Mr. John West. In works of which he (Mr. Brackenbury) had had the management, he had not found that "the coke from machine-worked retorts was not worth so much as that from the manual system by 1s. 6d. to 2s. 6d. per ton." Considering the importance of the system, he thought the author had treated inclined retorts somewhat summarily. Quoting figures similar to those mentioned in his Paris Congress paper, Mr. Brackenbury showed that the record of the progress of the system in the past ten years was not by any means a bad one. The keynote of the paper was cheapness; but that might, he said, be carried too far. The engineer had a certain duty to perform to maintain the efficiency of his plant.

The second speaker was Mr. C. E. Jones, whose fecundity in debate shows no abatement. He agreed that the gas capital of this country stands high, and thought one source of economy was to be found in distributing gas at higher pressures than hitherto. To work at a low pressure, he did not believe was economical in all cases. Guide-framing accounted for a quarter to one-third of the cost of a gasholder; and its abolition was another source of economy. As to the illuminating power of gas, twenty-five years ago he condemned anything over 16 candles; and to-day he said that gas of above 14-candle power was a waste to the ordinary consumer, if he would only employ incandescent burners. As for water gas taking the place of coal gas, he did not believe it would ever do so. It would be like Eve was to Adam—a helpmate.

On this latter point, Mr. A. G. Glasgow also claimed attention; but his remarks principally referred to a tabular statement which we are not publishing. However, in the items composing the total of 18·19d. per 1000 cubic feet of carburetted water gas mentioned by the author, Mr. Glasgow said that, if normal figures were substituted for oil, coke, and purification, the estimate, he had no hestitation in saying, would be reduced by 2½d. The auxiliary manufacture of water gas, he also observed, enhanced the price of coke, obviated cannel enrichment, and took care of the peak-load in winter and of emergency variations and burdens which would otherwise be borne by the retort-house. So far as the accounts were concerned, all the advantages thus obtained went to the credit of the coal gas; the means by which these things were accomplished were charged against the water gas. It was a question here whether common sense was not called for, rather than strict book-keeping. He further mentioned that he had received a statement from the manager of a gas-works, in which he had made an estimate of what his gas would have cost him for six months had it been all coal gas, for comparison with the actual cost, making a certain proportion of water gas. If he had made all coal gas, the cost would have been £88,000; what it actually did cost for coal and water gas was £68,000 odd—a difference of £19,000 odd in six months. This difference in one year would about pay for that manager's entire carburetted water-gas plant.

Having the hearing of the meeting at the time the discussion was adjourned on the 16th inst., Mr. Glasgow again commanded attention last Tuesday. The pith of his further remarks may be summed up in a few words. He had been looking into the items given by Mr. Jones in the making up of the total cost of carburetted water gas, and, in the light of figures obtained in actual work, was able to assure those interested that, if normal figures were taken for oil and coke, Mr. Jones's total cost would have to be reduced by at least 3d. per 1000 cubic feet, or if the whole quantity of oil charged for was used, then the illuminating power of the gas would be increased to 25 candles. Congratulations on the character of the paper were tendered to Mr. Jones by his South Metropolitan colleague, Mr. C. C. Carpenter. In their views on gas questions, there is much in common between these two engineering chiefs. Very modestly Mr. Carpenter refrained at first from expressing, as a gas engineer, any opinion on carburetted water gas; but he stood before this great gathering of engineers as a humble gas-consumer, and as such objected to the use of water gas as a means of getting over the peak load—not that it can be said that gas consumers, as a rule, understand much about "peak loads." However, as a gas consumer, the supply of water gas in varied quantities was objectionable to him, and unsatisfactory for use in incandescent burners. Having delivered himself to this effect, Mr. Carpenter dropped the garb he had assumed, and made the emphatic declaration that "we, as gas people," should see that every method of working that is adopted is carried out with a due regard to the interests of the consumer. While he has no objection to the use of carburetted water gas *per se*, he does say most decidedly that, in its admixture with coal gas, it should be used in uniform quantity. The strong standpoint taken by Mr. Carpenter on the subject of inclined retorts is well known; and he reiterated the view that he believes it is now generally admitted that the use of inclined retorts entails also the use of suitable coal. If this is admitted, he holds that it puts the use of inclined retorts on a different basis from what was originally intended. To illustrate his point, he mentioned a recent trial he has made with a North Country coal, whose yield was upwards of 10,000 cubic feet per ton when carbonized in horizontal retorts, but when used in inclined retorts the make fell to 8700 cubic feet. Following with some remarks on stoking machinery, it was gathered that his opinion is that the disadvantages of such machinery are not so serious as one might at first sight imagine; and he made a plea for greater attention on the part of gas engineers to the design and improvement of machinery suitable for use in the gritty atmosphere and special conditions prevailing in the retort-house. He also spoke of the work the South Metropolitan Company have done in connection with the transmission of gas at high pressures, and stated that the system is working very admirably, besides which they find the important result that the capital expenditure on gas-mains has been enormously reduced.

Responding to the call of the President, Mr. F. W. Cross, of Lea Bridge, gave some information of the method he has adopted in dealing with the coal for an inclined retort-setting which he put up last year. Starting the work with a rooted prejudice against elevators, conveyors, and such-like appliances, he was forced to apply his mind to the consideration of an alternative method of dealing with his coal; and in the end his fancy was hydraulic power. Outside the retort-house he has now an engine-house, boilers, engines, pumps, and accumulators. The power is conveyed from the power-house under the floor, with a lift placed in the coal-store, and which lift, operated by a direct-acting ram, rises to the hopper floor. In the coal-store are several lines of tramrails, along which run tip-waggons. The coal is put into these, the waggons are run along to the lift, and raised to the hopper floor, along which they pass to the hoppers. It puzzled Mr. Cross for a long time as to how he was to get only coal into the hoppers of suitable size for inclined retorts without using a mechanical coal-breaker. But eventually he overcame this by

placing above the whole of the hoppers a specially designed screen. The bulk of the coal falls through the screen into the hoppers; and what small lumps are left are easily broken by the men who work the tip-waggons. Mr. Cross believes this is the first time such an application of hydraulic power has been made for inclined retort-settings, or in a retort-house. He contemplates applying the hydraulic power to many other purposes. While not an absolute believer in the efficiency of the inclined system as we know it to-day, Mr. Cross declares his opinion that it is the carbonizing method of the future. The next to answer the call of the President was Mr. Joseph Cash, of Brighton; and he soon proclaimed himself as being in the ranks of the progressive gas engineers of the day. No truer words were ever written, he asserted, than those used by Mr. Jones regarding the wastefulness of gas enrichment. The cheapest description of coal that could be obtained at a gas-works should, in Mr. Cash's view, be the factor in determining the illuminating power of the gas to be supplied in every district. The parliamentary sanction given to the reduction of the illuminating power of the South Metropolitan Company's gas is, he declares, the wisest step ever taken in connection with this vexed question. Again, later on, Mr. Cash described himself as an advocate of water gas; but that will not, except perhaps to the few, be information to gas engineers. He has not found the little difficulty Mr. Carpenter alluded to; but probably this is because, as he told his audience, he keeps his supply of gas of uniform composition—that is, a given quantity of carburetted water gas to a given quantity of coal gas. But it was on the advantage of the system as a labour saver that Mr. Cash laid great stress. Like Mr. Brackenbury, Mr. Cash disagreed as to the coke from machine-stoked retorts being of a lower value than coke produced by retorts charged manually. Interesting were the remarks of Mr. Henry Fowler, who spoke as an engineer of a large Railway Company, and consequently as a gas consumer. We will pass over his request for information as to incandescent lighting for large systems, and will only stop to mention that he holds the view, entertained by many gas engineers in these days, that the calorific power of a gas and not its illuminating power will be the test of its value in the future. He deprecates the placing of high-power gas-lights on low standards spaced widely apart, and urges that, in order to get good diffusion of the light, such lamps should be fixed on standards of sufficient height. Water gas appeals to him mostly in connection with the freedom from naphthalene that is experienced where it is used. Over a large railway system to which gas is supplied from numerous different corporation and company works, he can remember no single naphthalene failure where water gas forms part of the supply; but it is a constant source of trouble in other places. This testimony is extremely interesting. Another point alluded to by Mr. Fowler had reference to the preservation of service-pipes. In the case of a railway system, the ground, as readers are aware, is made up largely of ashes, which have a destructive influence on pipes. Mr. Fowler finds that placing the pipes in rough creosoted boxes, filled with shavings and hot tar, constitutes an efficient protection.

The comparative figures given by Mr. Jones as to the cost of carburetted water gas and coal gas were handled by Mr. W. J. A. Butterfield to the decided advantage of the former. The figures, he pointed out, show that 20-candle power carburetted water gas was produced in June, 1900, when both coal and oil were dear, at a cost of only 1¼d. more per 1000 cubic feet than 14½-candle coal gas. Faced by such figures, the superficial critic might well ask why the manufacture of low-quality coal gas is continued. According to Mr. Butterfield's calculations, the critic could truthfully assert that the carburetted water gas would be superior to the coal gas for lighting purposes by 38 per cent., and for heating purposes by about 16 per cent. An addition of 1¼d. to a selling price of, say, 3s. per 1000 cubic feet is an increase of only 4 per cent. Hence the consumer would find the 20-candle power carburetted water gas the cheaper article for all uses. But Mr. Butterfield pointed out that the cheapness of production of the carburetted water gas would probably disappear if it became the staple product of gas-works; since it is, under present conditions of manufacture, dependent on the coal-gas plant for the supply of one of its two raw materials. If it were worked independently, the cost would be much greater perhaps; but still there is an inherent economy. He spoke of the inferior results obtained with water-gas plant when first introduced in this country compared with to-day, and referred to the Dellwik process for making simple water gas, which aims at giving 100 per cent. of the heating value of the fuel in the generator. Some analyses Mr. Butterfield has made quite recently of carburetted water gas from the plant put down at Southall by Messrs. S. Cutler and Son, tend to show that, unconsciously perhaps, the Dellwik principle has been embodied more or less in some carburetted water-gas plants of the present day. In the case of the Southall plant, he finds that fully 55 per cent. of the heating value of the fuel is utilized in the generator, and that the surplus heat carried forward in the half-consumed producer gas is more than sufficient to secure the proper gasification of the oil. Mr. Jones's reference to the heavy cost of purifying carburetted water gas, by reason of the large quantity of lime required, brought from Mr. Butterfield the statement that he found the gas from the Southall plant only contained 1200 grains of impurities per 100 cubic feet, which is the figure Mr. Jones correctly gives as being the amount of impurities found in coal gas. Mr. Butterfield believes that it is quite possible to continuously work to this high standard; and therefore with lime the cost of the purification of carburetted water gas certainly ought not to exceed that of coal gas. He also remarked upon the superior value of carburetted water gas as an enriching agent, and pointed out the fact, which, he believes, emanated first from the late Mr. John Methven, that the mixture of equal volumes of 20-candle power carburetted water gas and 14-candle power coal gas would give a gas of a much higher candle power than 17 candles—say about 18½ candles. Mr. Butterfield's explanation of how this comes about is briefly this: Coal gas of 14-candle power contains roughly 4 per cent. of the volume of hydrocarbons, commonly known as illuminants; 14-candle power carburetted water gas contains about 6 to 7 per cent. In other words, the remaining constituents or diluents are less well fitted than those of coal gas to develop the innate illuminative properties of the illuminating hydrocarbons. Now 20-candle power carburetted water gas contains about 14 per cent. of these hydrocarbons, and when such gas is mixed with coal gas in equal proportions, the coal gas diluents preponderate; and hence the illuminative duty obtained from the hydrocarbons is greater than when the two gases are burnt apart. Having regard to the low cost of carburetted water gas, the enrichment of coal gas to 16½ candles only costs a fraction of a penny; and therefore it appears to Mr. Butterfield hard to say whether there should be a reduction of the illuminating power of gas when it can be obtained at such a low cost. There was much else of interest in this gentleman's remarks; but we must not dip deeper into them.

A little explanation was then tendered by Mr. George Livesey regarding the figures taken from the Board of Trade returns by Mr. Jones, among others those referring to the increase of capital. As was pointed out by Mr. Livesey, the figures are misleading, as in quite a number of cases the capital has only been nominally increased. Two of the London Gas Companies, for instance, have nominally increased theirs by conversion to the extent of 13 millions or more, and purchases of gas undertakings by local authorities have also had the effect of swelling the capital. He has no doubt that the increase of the gas business shown by Mr. Jones has been obtained with an increase in capital of only, probably, 10 per cent., instead of the figure named in the paper; and, as a matter of fact, gas undertakings look to reducing the price of gas by reducing the capital per 1000 cubic feet. The remark was made by Mr. Livesey, in connection with the subject of machinery *versus* hand labour, that a man with a shovel and barrow, if he works properly, takes a great deal of beating; and he re-asserted his opinion that, in the introduction of machinery for stoking, very little advantage has been derived, because the power of the machine has been limited by the Trades Unions. Of all the absurd notions in connection with gas supply, Mr. Livesey regards as the most mischievous that of enrichment. Tens of thousands of pounds, he declares (and many will agree with him), are wasted year by year simply for the purpose of so-called enrichment; and this has been brought about by local authorities who, whenever any gas company goes to Parliament, press for an increase of illuminating power. They do not appear to see that they are taxing their own people. Mr. Livesey thinks that in time the best quality of gas obtainable by a gas undertaking from its most available source of coal supply will be the order of the day. Upon the question of water gas, he confessed that he knew nothing about the subject practically; and, he added, "I am glad I don't," which is one of those short, sharp sentences of his which conveys more than he really says. He stated again the difficulty he has had in getting at the actual cost of carburetted water gas; and mentioned the careful records that have been kept at the Crystal Palace Gas Company's works, where water gas is found to be "a long way behind coal gas." In a passing reference to high-pressure gas distribution, and the experience of the South Metropolitan Company, Mr. Livesey stated that they have done with the laying of large mains for many years to come. Confirming a remark that the gas industry was never so much alive as at the present day, he furnished the following interesting figures: In 1840, the total coal consumption for the manufacture of gas in South London did not exceed 20,000 tons; in 1870 the consumption was 200,000 tons; in 1890, 700,000 tons; and last year the consumption by the South Metropolitan Company exceeded 1,200,000 tons. Winding up a sketch of the improvement in burners from the single jet to the present high-pressure incandescent burners, Mr. Livesey gave the information that the South Metropolitan Company maintain incandescent burners at 1s. each per quarter if the lights do not exceed six; above that number the charge is 9d. per light per quarter. The present want of the gas industry was stated in a few words. What is wanted, said Mr. Livesey, is young men of ability. He is rather afraid that such young men look down upon the industry; but he pledged his word that there is in it great scope for the gas engineer, and that it is a most interesting occupation.

Another leader of the industry rose—Mr. Corbet Woodall; and he gave expression to the opinion that, if Mr. Livesey spoke on the subject of carburetted water gas a few years hence, he would have an equally interesting, but a different, story to tell. Upon which Mr. Livesey interpolated the remark "Non-illuminating water gas perhaps." Emphatic support was given by Mr. Woodall (it is really an old view of his) to what had already been said that there is still a field in gas lighting for young men of education and energy. He thinks this belief is supported by the experience of a great many years past—that there is still in gas supply as healthy a field for development as there is in the great field of electricity. In speaking of the improvement that has taken place in modern

gas practice, Mr. Woodall expressed his surprise that more attention was not given by Mr. Jones to what has been done outside our own country. In Mr. Woodall's opinion, Continental engineers are sometimes more original and more scientific and exact in their investigations than are those on the gas side of the engineering profession at home. The developments that have taken place on the Continent from the gas engineering side are indeed very striking. He also put in a plea for the greater combination of the work of the chemist and the engineer than we have had in the past. He came near home, too, with an observation to the effect that there was no need for the Provincial gas engineer to come to London to see progress in gas engineering; and if he did, Mr. Woodall hinted that he would be very disappointed. Regarding capital expenditure, he remarked that where capital expenditure is productive, he should be sorry to see it spared. He does not think that the utmost has been done when apparatus is bought at a minimum cost, and housed as cheaply as possible. Something is due to the neighbourhood, and to one's own pride in the work when it is done. He reminded his hearers that Mr. Thomas Hawksley built a great many gas-works in England, and that they were erected at a considerable expenditure per unit of gas made—probably larger than the average gas engineer would countenance in these days. But all these works are standing now, and much the same as Mr. Hawksley built them; and the people of the towns where they are situated are proud of them—in fact, they are rather an ornament than a disfigurement to the towns. He next commented on the statements of the author regarding the advantages which have resulted from the introduction of the sliding-scale. While quite of opinion that the sliding-scale has been an advantage to both supplier and consumer, he thought it was certainly a mistake to credit the sliding-scale system too much with the economies that have resulted since its introduction. If the actual prices charged to-day are compared with those which were charged (say) in 1876, when the system was introduced, it will be found that the whole of the difference—that is to say, the whole reduction—in price that has taken place in the interval has been due to the diminution in the net value of the coal, and to the reduction in the charge for capital which has resulted from the compulsory sale of stock by auction. This point Mr. Woodall thinks is worthy of notice, because it is a mistake to get away on a false scent in regard to the changes that have taken place. Mr. Woodall was also a little surprised that more was not said in the paper regarding recent engineering construction; and on the subject of inclined retorts, he mentioned that, in his own observation, there is hardly a retort being built in Continental works that is not on this principle. While expressing his great respect for Mr. Carpenter's opinions on this and other matters, he thought the difficulty he has found with regard to the slipping of coal could be overcome comparatively easily by the blending of the coals, so that those which have the tendency to creep would be withheld by those that have not the tendency.

On the last point, Mr. Chas. Hawksley followed with an allusion to a recent visit he made to a gas-works in the North of England where inclined retorts were in use, and were giving complete satisfaction. He was also glad the subject of electrolysis had been recognized by Parliament, and that protection has been given to a gas company in regard to any injury done to their pipes and apparatus.

Time did not permit Mr. Jones giving a full reply to his critics; but it is understood that he will send a written answer for publication in the "Transactions" of the Institution. Regarding Mr. Woodall's cure for the creeping of coal in inclined retorts, Mr. Jones pointed out that the blending would be a matter of difficulty where large quantities of different varieties of coal are used. Gas-works must, he said, be worked so as to meet the ordinary vicissitudes of the business. On the question of the price of raw materials, he tendered the interesting information that coal which was delivered on board ship to-day at 9s. per ton, last year cost 16s., the year before 8s., and in 1852 only 4s. 3d. With several remarks of various speakers he agreed; and in his expressive, characteristic way, he urged the "desirability of young men of education not scorning this humble industry of gas." It would perhaps have done some directors good to have heard his sarcastic reference to their views on the question of the salaries which they offer to gas engineers; but notwithstanding he believed there is still a bright future for the profession. A good word was said as to the work Mr. Morris and others have done at Brentford in the cause of the inclined retort system; and on the question of carburetted water gas, he asked what the gas engineer is to do if he cannot get a cheap supply of oil, of which there is not an unknown quantity to be obtained. In his concluding remarks, he explained that, in writing the paper, he confined it to those appliances which, in thirty years' experience, he had found most efficient in producing gas which would meet the microscopic examinations to which it is subjected in London. On resuming his seat, Mr. Jones was heartily applauded.

Professor James Dewar, M.A., LL.D., F.R.S., has been elected an honorary member of the Institution of Civil Engineers.

Dr. W. Collingridge, Medical Officer for the Port of London, has been elected Medical Officer of Health for the City, in succession to the late Dr. Sedgwick Saunders. The post of Public Analyst was also rendered vacant by the death of Dr. Saunders; and it has been secured by Dr. Frank L. Teed, Public Analyst for Islington and Camberwell.

THE GLASGOW EXHIBITION.

Glasgow at the moment appears to the stranger within its gates to have but one set purpose, and that is to make the Exhibition which is to be opened on Thursday, and continued until October (Sundays excepted), a success in the full meaning of the term. We have not the slightest hesitation now in saying that the exhibition itself, in the vastness and variety of its collection, will be representative of the arts, sciences, and manufactures of Great Britain and other countries; and whatever profit may flow to the city either directly from the exhibition, or indirectly in the fillip it will give to trade and business, no one will grudge the people—the enterprise is theirs, and consequently any benefits that may accrue. The exhibition, as we previously indicated* is situated in Kelvingrove Park and adjoining grounds; almost 100 acres being enclosed. If one could be transported suddenly from home, and be set down in the midst of the buildings which now cover the site, it would not be difficult to imagine oneself again in a section of the great Paris Exhibition of last year, which is now little more than a dream to the visitor, other than the Parisians who have still before them in the city some of the big structures as mementos of their grand creation. There in Kelvingrove Park stand numerous—some imposing—buildings, constructed of steel and wood and cementitious plaster; and their white stucco integument glistens brightly in the sunlight during the day, and in the night-time the large range of the main building is thrown into prominent relief by the searching light of the magnificent display of high-pressure incandescent gas lighting with which the Welsbach Incandescent Gas-Light Company have fitted up such a large part of the grounds. Viewed from any vantage ground, the scene which meets the eye is a picturesque one—just as in Paris not many months since, but in the more circumscribed area, stand many buildings of strange but artistic and pleasing design to one whose eyes have become accustomed to the hard lineaments of the modern architecture of the great cities of our country. Whichever way the eye turns, it meets the white buildings of varied size, minarets standing out in delicate outline against the sky, domes large and small, and coloured kiosks and balconies; and through the middle of the well-planned grounds flows the River Kelvin, which also appears to be putting forth an effort to bring itself more into harmony with the scene on either side of its banks, the beauty of which scene is fast being revealed by the turning of that which is disordered into order by an army of willing and industrious workers.

The main exhibition buildings are divided into three groups, the industrial hall, which is 700 feet long, 360 feet wide, and covers 6 acres; a magnificent hall 500 feet by 340 feet, for machinery in and out of motion; and the Grand Concert Hall. In the grounds, there are the pavilions and the special buildings erected by foreign Governments, public companies, and private firms. Of course, the industrial exhibits of our own country predominate; but there will in a few days be exhibits ready for inspection from the following countries: Russia, France, Austria, Japan, Morocco, Persia, Denmark, India, Western Australia, Canada, Queensland, British South Africa, and South Australia. The big advance that has been made during the past fortnight with the display of the goods in their allotted positions, gave the promise, at the time of our inspection last week, that Thursday of this week would see the whole practically completed. It does not (and we are not altogether unthankful for it) come within our province to describe fully the character and types of the entire collection of goods and works of art and industry which has been brought together; but, from the survey made last week, we can give our readers an indication of what they will find there which will be of superlative interest to them from their professional side of life. The gas lighting takes a prominence which places it far and away to the fore; Class VI., which comprises lighting and heating, comes next; the machinery department will rival the latter in attraction; and then a few exhibits of side importance to the engineer will also claim attention.

The Exhibition Lights.

Dealing first with the chief lighting, in arranging the general scheme, the Committee have aimed at presenting to the public examples of various systems of illumination by means of electricity, ordinary gas, high-pressure gas, acetylene, and high-pressure oil, so as to enable those interested in lighting to examine the various systems employed, and compare their efficiencies. A careful inspection of the lighting has strengthened the faith that was already strong within us; and therefore out of the ordeal of critical comparison, we say emphatically that gas will emerge in the van. The centres of the North and South Gardens are being lighted by the high-pressure gas system laid down by the Welsbach Company. A special article is devoted to this splendid example of what can be done by gas delivered at increased pressures (p. 1108); and therefore nothing further need be said about it here, beyond that Keith's compressors are used for raising the gas pressure, and these have been lent by the Water Motor and Liquid Elevator Company, Limited. Further reference is also made to these compressors in the article referred to. A small portion of the North Gardens is being lighted by the Scott-Snell Company with their self-intensifying lamp; and the East Gardens by the Kitson Company with their high-pressure oil system. The illumination of the Lighting and Heating Section has also been

* See "JOURNAL" for Feb. 12 last, pp. 389-91.

confided to the Welsbach Company; and they will show there what can be done with ordinary Kern burners. Acetylene lighting will be found in No. 7 restaurant, the press room, and band stand, and in the farm-steading and agricultural building.

The electric lighting of the exhibition buildings has been divided into three distinct sections—viz., the Industrial Hall, the Grand Avenue, and the Machinery Hall; and each section is still further sub-divided into several circuits, so that no serious inconvenience would be felt should any breakdown occur. The Industrial Hall is lit by means of 345 10-ampere Brockie-Pell arc lamps, and 404 16-candle power Zurich incandescent lamps; the Grand Avenue by 105 10-ampere Brockie-Pell arc lamps, and by 120 16-candle power and 20 200-candle power Ediswan incandescent lamps; and the Machinery Hall by 250 10-ampere Brockie-Pell arc lamps, and 200 16-candle and 30 200-candle power Ediswan incandescent lamps. The lighting of the Fine Art Galleries has been carried out by the Glasgow Corporation Electricity Department; and about 4000 incandescent lights have been installed, and 100-horse power for motors. The Concert Hall is entirely lit by 326 16-candle power and 61 32-candle power Ediswan incandescent lamps. The west portion of the North and South Gardens are illuminated by 90 10-ampere Brockie-Pell arc lamps; and these are the ones which come in prominently for, and come out badly in, comparison with the Welsbach high-pressure gas system. The engine power is supplied by nine firms; and an equal number of firms furnish the necessary dynamos—among the names figures that of D. B. Peebles & Co. The steam-boilers have been erected by five firms, one of them being the Stirling Boiler Company, Limited, whose exhibit we desire to specially notice. This Company have two boilers on view—one of which is fired by means of a Vicars' mechanical stoker; and the other by gas supplied by a Duff producer, which consumes the exhibition refuse, and is situated just outside the boiler-house. This producer was referred to by Mr. Isaac Carr during the discussion on Mr. Humphrey's recent paper before the Institution of Mechanical Engineers; and the specifications of Mr. Duff's patents have lately been noticed in these columns. In the case of the boiler fed by the producer, it can be readily changed to hand-firing should the supply of refuse fuel for the producer become exhausted. We have called attention to this working exhibit in order that gas engineering visitors, who may desire to investigate the use of producer gas for this purpose, may not overlook an excellent opportunity of doing so.

With this little digression, we will turn again to gas lighting, and refer, in the first place, to a display which Mr. Keith is making of his new burner for high-pressure work, which was recently noticed in these columns (*ante*, p. 682). Outside the gas compressing-station he has erected a large lamp, of ornate appearance, but in our opinion too heavily ribbed and banded for the purpose. The lantern itself, however, is a small matter; and it is of the lights inside that we desire to speak. The lamp is fitted with a cluster of four of the burners, each of which has a reputed illuminating power of 300 candles; so that the total light-giving power of the combination is 1200 candles. On Thursday night there was quite a refulgence of light in the neighbourhood of the lamp; the mantles were uniformly incandescent from base to apex; and notwithstanding the broadness of the ribs and bands of the lantern, no shadows could be detected beneath. In the compressor-room are two clusters of three of the same burners; and round a kiosk water fountain on the James Keith and Blackman Company's stand in the machinery hall will be found four more lamps, each of 1000-candle power, supplied with gas at high pressure by means of compressors on the stand. As the features of these new burners have been so recently described, no further reference to them is needed.

The portion of the grounds occupied by the Scott-Snell Lamp Company is adjacent to the compressing-station; and the self-intensifying lamps seem to be bidding defiance to the neighbouring lamps which are dependent upon auxiliary means for realizing their high power. The Company have adopted a rectangular lantern for their display; and the only change needed to adapt the intensifying mechanism for such lanterns appears to lie in the shape of the cover at the top. It is made to suit the dimensions and shape of the particular lantern; but as regards all other parts of the lamp exactly the same fittings are employed. A modification in the exact disposition of parts has been made as regards the mounting of the burner. Hitherto the high and low pressure gas supplies were joined together in a common base which contained a "reverter," and a Peebles governor was fitted in one of the rising pipes leading up to the reverter. For examination purposes, this has been changed, so that the reverter is divided in its functions. Its bye-pass action is effected by a separate valve, while the controlling of the aperture area for high and low pressure is effected by a simple float in the nipple. It therefore becomes possible to detach the burner, examine the float in the nipple, clean or blow out all gas apertures, detach, clean, or examine the governor, and open up, remove, or examine the bye-pass valve, without breaking any permanent connection, and without using a tool. The introduction of anti-vibration appliances is also facilitated by this arrangement; the tubular connecting-pipe between the nipple and governor may be severed, and a vibration killing connection used in place of the rigid metal-to-metal junction. The connecting-pipes forming the harp frame lie neatly in the angles of the lantern frame, and do not add to the shadows. A simple but effective buffer arrangement is mounted on the head of the displacer spindle, so that, should the gas supply be partially cut off to reduce the light, the increase in the vacuum effect (due to inability to draw in a full charge of gas) will not cause the displacer to make a noise by tapping the hot dish below. The lamps are now rapidly filled with water without the need of a ladder, by a sort of hollow shepherd's crook, which is hooked into the aperture in the waterhead, and connected at the base by a rubber tube to a small hand-pump in a bucket of water. The material used in the diaphragms is a new composition, very light and flexible under all conditions, and costing only a few pence per lamp. Only a single burner is placed in each lantern in this instance; but the light from each lamp will probably be set for a higher unit than usual, as the lamp automatically supplies and keeps in reserve a much higher pressure than the traditional 8 or 10 inches of water. The governor and nipple may be adjusted to produce any unit desired, within a considerable range. So much has been written concerning this interesting invention that, beyond the foregoing reference to small departures in the construction of the lamp, nothing more need be said; but gas engineers will give them critical examination, and watch their behaviour under the very exacting working conditions which the close proximity of other forms of lighting assists in imposing.

In the West Gardens will be found an interesting exhibit by the Patent Paraffin Gas Lighting Company, of Glasgow. It is a complete plant for the lighting of country mansions, &c., by gas made from intermediate paraffin oil, 11 gallons of which are said to give 1000 cubic feet of 60-candle gas. The gasholder attached to the plant has a capacity of 300 cubic feet, and is 8 feet diameter and 6 feet deep. No purification of the gas is considered necessary. A room is being equipped with burners—both flat-flame and incandescent—in order that comparisons of the oil-gas lights may be made with coal-gas lights. According to figures supplied to us by the attendant, with a No. 00 Bray burner, using 1½ cubic feet of the oil gas per hour, an illuminating power of about 25 candles was obtained; and with an incandescent burner, consuming 2 cubic feet per hour, a light of 100 candles is secured, and with 1¼ feet 60 candles. When employing one of the old types of incandescent burners with the oil gas, an "adapter" is used for the regulation of the air supply; but this is found unnecessary with the new Kern burner. Hard by, will be found working installations of acetylene plant—the exhibitors being Messrs. John Finlay and Co., of Glasgow, the Bon Accord Acetylene Gas Company, of Aberdeen, and the Manchester Acetylene Gas Company. It may be conveniently mentioned here that in the North Gardens, the Notkin Syndicate have space allotted to them for an exhibit of their system of generating gas from petroleum.

This record abundantly shows that there is a variegated collection of lights and lighting systems in the exhibition; and were there no other exhibits in which gas engineers were specially concerned, these would alone suffice for a recommendation to them to visit Glasgow.

Domestic and other Gas Appliances.

Class VI., which is described as being devoted to lighting and heating, is also housed in the West Gardens; but from the gas engineer's point of view there will not be found a sufficient diversity of exhibits. The most prominent stalls will be those of gas-stove makers; and even in this branch of the gas business, some well-known firms are absent. At the same time, there will be a sufficiency and to spare in this particular line of goods. It would have been better from our point of view if a limitation could have been imposed, and examples or models of other branches of appliances used (say) in the manufacture and testing of gas could have been brought within the pale of this section. Ordinary burners, too, for the consumption of gas are entirely absent. However, the fault, we should imagine, lies at the door of the manufacturers themselves; for, if we remember rightly, long ago an advertisement appeared in the "Journal" inviting applications for space, with an offer of a free supply of gas by the Corporation Gas Department. But the responses were not altogether encouraging; and an exceptionally good opportunity for making the public better acquainted with the methods adopted for ensuring to them gas of pure and useful quality has been lost. However, what exhibits there are, and will be in the course of a few days are good in their spheres. When we visited the building last week, packing cases and uncovered exhibits were the predominant features. A few of the exhibitors were well advanced with their preparations, but others had not even put in an appearance. A respectful care for the preservation of the external lustre of their goods while carpenters and other creators of dust were in evidence, may be sufficient explanation of their tardiness. Enough was seen, however, to convince us that the manufacturers who will be represented by the products of their factories have sent of their best to Glasgow. Of the gas-stove makers, it would be hard to say whether any one of them excels another in quality of the display made; if one does excel, it will be rather in the direction of extent than in quality and finish. While, of course, there are makers who cater for customers requiring a cheap class of goods, the competition between the producers of the better types is so great now, that their commodities have been, and have had to be (if on no other ground than that of saving their own heads), brought to such a pitch of perfection that it is difficult to say to which, if faced by specimens of each, one would give the laurel. The differences consist in details only. One gas-stove possesses small improvements not incorporated in another; but the other also has its little individual conveniences.

Therefore, it would be a waste of space, and an idle effort, to attempt the task of discriminating between the exhibits at Glasgow; the simple naming of the exhibitors will suffice to inform

our readers of the character of the principal exhibits. In cooking and heating stoves and appliances (both for industrial and domestic purposes) the manufacturers are: Carron Company, Dobbie, Forbes, and Co., Fletcher, Russell, and Co., R. & A. Main, M'Dowall, Steven, and Co., Richmond Gas Stove and Meter Company, T. Robertson and Co., Smith and Wellstood, and Wilsons and Mathiesons. Gas or Oil Heating Appliances: Clark and Co., and Robert Maclaurin. Meters: Alder and Mackay, Thomas Glover and Co., and Richmond Gas Stove and Meter Company. Several of the first-named firms also exhibit appliances for use in laundry work; and on other stands (occupied by exhibitors outside the traders in the gas industry) laundry apparatus takes up a deal of room. The building is of fair size; but not larger than the importance of the section demands. There will be no waste space in it; but we reiterate that the building would have had greater attractions if other manufacturers had come forward, and given to the collection of gas goods a more diversified interest. The position of the building, too, is not one which will bring to it a constant flow of people; but, on such occasions as this, the exhibitors cannot be the choosers—they have to take what they can get. To justify the use of the word lighting in the title of this section, some of the exhibits of lights referred to earlier in the article are classified therein.

Miscellaneous Gas Goods, Artificial Fertilizers, &c.

Scattered about the exhibition, and mixed up with goods belonging to other industries, will be found sundry examples of articles and apparatus with which the professional gas man is constantly in touch. For instance, in a striking position in the main internal avenue, Messrs. F. & C. Osler have a very attractive collection of artistic designs in gas globes, fittings, and other glass ware; in the Grand Avenue, gas and electric-light globes are displayed by Mr. John Baird; and in the Concert and Industrial Halls, the diffusing globes of Holophane, Limited, will be found fitted with bracket and pendant lights. In Class II., in the Grand Avenue, fire-clay goods are placed on view by the Glenboig Union Fire-Clay Company, Messrs. Hurll, Peter, and Mark, and the Gartcraig Fire-Clay Company; and in the Machinery Section, one stumbles across further specimens on the stand of Messrs. J. Dougall and Sons. Even gas-pipes are not overlooked in the displays made in the Machinery Hall by Messrs. A. & J. Stewart and Menzies, Limited, and Messrs. Macfarlane, Strang, and Co. In the Grand Avenue, Dr. Ludwig Mond takes advantage of an exhibit of samples of ore and refined nickel to make the public acquainted, by the aid of models and photographs, with his patent gas-producing plant, with and without the recovery of sulphate of ammonia.

In the Agricultural Hall will be found a representative display of artificial fertilizers; and the Sulphate of Ammonia Committee have taken care to be present with specimens of sulphate of ammonia produced by five different processes, and examples of products to show the advantages of ammonia as a fertilizer. The Nitrate Committee show an equal anxiety to inform the public of the virtues of their *protégé*. In the group of oil and chemical exhibitors to be found in the Main Avenue, sulphate of ammonia is again advertised by samples; and in its company on some of the stands are to be seen phials of gas and other oil. We may specially direct attention in this category of exhibits to the displays of the Pumpherston Oil Company, the United Alkali Company, Messrs. John Riley and Sons, Young's Paraffin Light and Mineral Oil Company, Messrs. Brunner, Mond, and Co., and the Broxburn Oil Company; while, in passing through the Machinery Hall, the visitor will perhaps again observe further samples of sulphate among the productions of the Glengarnock Iron and Steel Company and the Glasgow Iron and Steel Company.

In the Machinery Hall.

For the Machinery Hall, we may bespeak the attention of the engineer, who, we can confidently assert, no matter to which branch of the profession he belongs, will find it abounding in works of interest. Foremost in attractiveness for the gas engineer, will be the long string of gas-engines of various powers, furnished by Messrs. Crossley Bros., the Campbell Gas-Engine Company, Messrs. J. E. H. Andrew and Co., the National Gas-Engine Company, Messrs. Willcox Bros., Messrs. Pollock, Whyte, and Waddel, the Forward Engineering Company, and the Acme Manufacturing Company. Separate exhibits will be found in other places in the hall by Tangyes, Limited, and by Messrs. Furnival and Co.; and it may be conveniently stated here that a 125-horse power Westinghouse gas-engine is to be seen in the North Gardens coupled to an electric generator. The Pulsometer Engineering Company occupy a stand with appliances which gas engineers have so frequently found useful. To the Stirling boiler fed by gas generated by a Duff gas-producer we have previously referred; and in the same connection, the engineer will inspect the photographs and models of the Thwaite-Gardner system of utilizing waste gases of blast-furnaces for the economic production of power. In these days in which there is a growing interest in high-pressure gas distribution, the stand of the Sturtevant Engineering Company will not be passed unnoticed. The James Keith and Blackman Company's interesting group of exhibits has already been alluded to when dealing with the lights of the exhibition. Labour-saving and rapidity in the erection of such structures as gasholders, by the use of pneumatic drills, riveters, hammers, and caulking tools being a feature of latter-day engineering, the stalls of the International Pneumatic Tool Company and Messrs. R. G. Ross and Sons should be examined. Then, in view of the praise accorded to the recording pyrometers of the Cambridge Scientific Instrument Company, Limited, by Mr. J. P. Leather, of Burnley, at the Paris Congress last year, the stand of that Company should not be overlooked; and in conjunction with it, the samples of calorimeters, pyrometers, &c., shown by Messrs. Schaffer and Budenberg should be inspected. Worthy of examination will be found the patent travelling tower transporters for material, of the Temperley Transporter Company. The flexible metallic tubing in bronze and steel for steam, air, gas, ammonia, tar, &c., placed on view by the United Flexible Metallic Tubing Company, Limited, also possess much interest. In bulk, the electrical machinery overshadows other classes; but if their size causes any fear or trepidation in the breasts of gas engineers, they will only have to wait till night time to obtain a specific (in the form of high-pressure gas lighting) in the grounds. However, out of the vast collection of electrical apparatus, gas engineers will no doubt seek out for examination the electrical work which Messrs. D. Bruce Peebles and Co. are in a position to undertake.

We have exhausted the exhibits specially appertaining to the gas industry; and though it may be our view that some branches are inadequately represented—domestic gas lighting, for example—we are abundantly content with what has been done to demonstrate the capability of gas for street lighting, cooking, heating, and motive power; and that contentment will, we have no fear, be endorsed by gas engineers when they have had an opportunity of seeing for themselves. To the exertions put forward by Mr. Foulis, and for the support of his Committee, the best thanks of the gas industry are due; and it is our pleasure to be among the first to tender them.

PHYSICAL AND CHEMICAL EFFECTS OF ARTIFICIAL ILLUMINANTS.

Under the title of "The Hygienic Value of Acetylene," Herr Neuberg, of Charlottenburg, has recently published an article going with extraordinary minuteness into the laws governing, and the phenomena accompanying, the combustion of gases—summing up his conclusions respecting the value of acetylene in comparison with other artificial illuminants in tabular form. This table is reproduced from the "Engineer," who have modified it throughout to suit English standards. Neuberg's figures were all given in Hefner units of light; and they have been recalculated according to the ratio of one Hefner unit to 1·14 English standard candles. The seventh and ninth columns in the table, showing the carbon dioxide evolved and the air consumed in cubic feet, have been interpolated into the author's own table; but the figures recorded must be taken as close approximations only.

Illuminant.	Percentage of Total Energy Manifested as		Large Calories Evolved per Candle-Hour.		Water Evolved per Candle-Hour.	Carbon Dioxide Evolved per Candle-Hour.		Air Consumed per Candle-Hour.	
	Light.	Heat.	Total.	Radiant.	Grammes.	Cubic Feet.	Grammes.	Cubic Feet.	Grammes.
Acetylene—									
Duplex burner	2·36	97·74	6·33	0·93	0·36	0·031	1·74	0·18	6·84
Bray burner			6·88	0·95	0·33	0·029	1·61	0·17	6·31
Coal gas—									
Flat flame	0·35	99·65	37·72	3·26	17·90	0·360	20·26	1·62	59·40
Argand	..	..	37·11	5·59	6·05	0·140	7·72	1·60	58·40
Incandescent	0·75	99·25	9·30	1·2—1·9	0·88	0·020	1·05	0·40	14·60
Electricity—									
Arc	26—38	74—62	0·50	0·51	..	..	..	..	..
Edison	7·14	92·85	1·75	2·22	..	..	..	..	..
Nernst	..	..	0·70	..	..	..	..	..	..
Osmium	..	..	0·61	..	..	..	..	..	..
Petroleum oil—									
Luminous	..	..	36·14	9·21	4·44	0·190	10·96	1·4	50·90
Incandescent	..	..	15·00	..	..	..	..	0·5	18·00
Alcohol, incandescent	..	..	9·19	..	..	..	..	0·35	12·70
Paraffin candle	0·44	99·56	66·80	9·44	8·00	0·350	19·56	..	..

NORTH OF ENGLAND GAS ASSOCIATION.

The Half-Yearly General Meeting of this Association was held last Saturday, at the Gas Offices, Newcastle-upon-Tyne, where the members were cordially received by the Engineer of the Company (Mr. W. Doig Gibb). The PRESIDENT (Mr. E. H. Millard, of Durham) took the chair promptly at twelve o'clock; and forthwith the business on the *agenda* was taken in hand.

Scrutineers of the balloting-papers for the election of officers were first appointed—the choice of the members falling upon Messrs. John Hall and T. Worfolk.

THE ANNUAL ACCOUNTS.

The PRESIDENT, referring to the statement of annual accounts which had been distributed among the members, stated that the balance in hand (£62 11s. 2d.) was somewhere about the same figure as that to which they had been accustomed. He had pleasure in moving their adoption.

Mr. ISAAC WALTON (Corbridge) seconded the motion, which was unanimously carried.

A LARGE EXPANSION IN MEMBERSHIP.

The PRESIDENT announced that there were a large number of candidates for election as members and associates on this occasion; and he would ask the Hon. Secretary to read the list.

The HON. SECRETARY (Mr. J. H. Penney, of South Shields) read the names as follows:—

Members.—Mr. H. Foss, of Thirsk; Mr. A. F. Goodson, of Heckmondwike; Mr. E. G. Grimshaw, of Calverley and Horsforth; Mr. George Hemingway, of Chester-le-Street; Mr. Herbert Legge, of Market Weighton; Mr. W. Marshall, of Northallerton; Mr. G. D. F. Peeks, of Ripon; Mr. Ralph Spivey, of Pocklington; Mr. Thomas Wright, of Cottingham; Mr. Andrew Wilson, of Bradford; Mr. John Wilkinson, of Pudsey; Mr. T. Weatherley, of North Ormesby; and Mr. Alfred Welford, of Howden.

Associates.—Mr. T. L. Archer, of Eccles; Mr. C. Cooper, of Goole; Mr. W. Duff, of Morecambe; Mr. I. B. Fenwick, of Retford; Mr. S. Meunier, of Stockport; Mr. George Mills, of Darlington; Mr. I. C. Pennington, of Colwyn Bay; Mr. John Robinson, of Higher Broughton, Manchester; Mr. Robert Scott, of Bradford; Mr. Herbert Spinks, of Hapton; Mr. D. Thompson, of Handsworth; Mr. John E. Williams, of Manchester.

The motion for the election of the whole of these members and associates was unanimously carried.

The PRESIDENT remarked that they had elected a grand number of new members; and therefore they certainly ought not in the future to be in the position in which they found themselves again at this meeting, of being without any technical matter for discussion. However, Mr. Gibb had kindly come to the rescue by allowing the members to visit the gas-tank on the site of the new works at St. Anthony's.

The names of several gentlemen who had sent letters of apology for non-attendance were read, and then the members proceeded to the consideration of the chief item on the programme—viz.,

THE REPORT OF THE COMMITTEE ON THE PROPOSED FEDERATION OF GAS-WORKS EMPLOYERS.

The HON. SECRETARY read the report as follows:—

In November last, your Committee issued the following circular, and a copy was posted to each member and associate—141 in all:—

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

South Shields, Nov. 21, 1900.

Proposed Federation of Gas-Works Employers.

Dear Sir,—At the half-yearly meeting of this Association held at Durham on the 6th ult., it was proposed by Mr. T. Bower, of West Hartlepool, that some sort of Conciliation Board or Reference Committee should be organized to deal with the labour question pertaining to all the gas-works connected with the Association; and the matter was referred to the Committee to see if they could formulate a suitable scheme, or make a report upon the subject at a future meeting of the Association.

The Committee recently held a preliminary meeting to consider the question. However, before going more fully into the subject, they would like to have some expression of opinion from the members generally, to guide them in the matter. I am therefore requested by the Committee to ask whether you consider it desirable, or not, to establish a Conciliation Board or Reference Committee to deal with the labour question. If you are in favour of such a scheme, can you offer any suggestions likely to be of service to the Committee?

Your early reply will oblige, yours faithfully,

J. H. PENNEY, Hon. Sec.

Only twelve replies were received to the above—six in favour of the scheme, and six against it. The former, with one exception, offer no suggestions; the latter advance strong arguments in opposition to the scheme, which may be summarized as follows:—

That the Association is not powerful enough (especially in funds) to take up such a large piece of work.

That if the Association were to form a Conciliation Board or Reference Committee from among their own members, the workmen in the various works affected would utterly refuse to recognize them as an impartial tribunal.

That, if the Association tried to establish a Conciliation Board or Reference Committee composed partly of their own members and partly of workmen from various works, the body to be representative would have to be of such huge proportions as to make it unwieldy, if not unworkable.

That, even although this unwieldy body was formed, the Directors of the larger works would probably not recognize its existence.

That—and this is the gist of the situation—no Conciliation Board or arbitration is of much effect so long as an irresponsible body of men is party to it.

That the men who are under the management of our members, belonging, as they do, to different Unions, or to no Union at all, would never combine to accept any such scheme as could be formulated under the present proposal.

That, as this is a matter quite outside the province of the Association, it is not desirable to graft such an organization on to a purely technical society.

Having very carefully considered this matter in all its bearings, and judging from the little interest taken in it by the bulk of the members, and the strong opinions quoted above, your Committee are unanimous that the question should be dropped.

Before sitting down, Mr. Penney said he should like to add, by way of supplement, a word or two on the subject. They all knew that Mr. Bower was usually to the fore with any scheme which he considered would be of service to the Association; and he must therefore feel some disappointment that the suggestion he made at their last meeting had not been favourably entertained. It was a consummation devoutly to be wished that there should be some practical method of settling or adjusting labour questions as they turned up. However, he (Mr. Penney) rather thought such matters were best taken in hand by the parties immediately concerned. He would go a step further, and say, with the assistance of their nearest neighbours. Such an arrangement had been tried in the district; and it worked out very well. It came about in this way: A few years ago a local gas company had an application from their workmen, through the Union, for a considerable increase in wages and certain holiday concessions. The managers of four neighbouring gas companies kindly undertook to act as a Reference Committee; and the matter was satisfactorily settled. Again last year, a similar application was made, but, in this instance, simultaneously to three local gas companies. The directors and officials of the companies in question federated, met the men and their representatives from time to time, and had all the points at issue argued and threshed out, with the result that a modified arrangement fairly satisfactory to all parties was arrived at, with the proviso that it was to remain in force for a period of two years. To any members who might be similarly situated with their men in the future, he would say go and do likewise, should their own efforts fail in the first instance. He was at the service of the members if there was any information he could give them on the subject. There would ever be differences to adjust between capital and labour so long as the rates of wages and conditions of work varied throughout the country. In any attempt to arrive at a permanent settlement, one of the first measures to be aimed at must be a standard rate of pay to each class of workman. But the conditions of work must be uniform; and they knew how these conditions varied at different works. The one must go hand in hand with the other, or they would never reach anything like finality. If it were properly worked out, and adapted to gas companies generally, the profit-sharing system was a natural preventive of labour difficulties. On the other hand, the adoption of labour-saving appliances would undoubtedly tend in time to abolish labour crises. He did not at all blame the gas workers for making the best bargain they could with their employers, by every fair and legitimate means in their power. It was just what they (the members themselves) were all doing, he supposed. Moreover, it was the duty of every man to try and raise himself to as high a social plane as he could.

The PRESIDENT remarked that he had said earlier in the meeting that they had no technical matter to discuss; and therefore they readily welcomed the remarks made by Mr. Penney. They covered the ground in a most admirable manner; and he should be glad to hear further observations on the subject.

Mr. T. BOWER (West Hartlepool) remarked that he did not think he could say anything in addition to what he had already said on this matter. Mr. Penney was quite right when he stated that he (Mr. Bower) was disappointed at the result of the Committee's efforts. He did not make the suggestion at the last meeting without some thought. As a matter of fact, he had gone very carefully into the whole question; and perhaps he had been driven to it by reason of his own labour difficulties. However, it had occurred to him that, in dealing with labour matters, they were, as it were, split-up into sections among themselves—he was speaking now of the gas business solely. Mr. Penney referred to an incident that took place with reference to a neighbouring gas company. He (Mr. Bower) knew the whole of the circumstances of that case. Then there was another Committee which was in operation, or about to be formed, at the time he made his remarks last October in connection with three other leading gas companies in the North of England. Now it seemed to him that, in these two cases, they had a fair illustration of what was really required for getting out some basis of action which could be applied to the majority of gas companies. But while giving the Committee credit for having done all that they no doubt could so far as they went, they might perhaps have gone farther. What, however, they had done, he was perfectly sure had been done in the utmost good faith, and with a desire to bring something forward that would be a benefit to gas companies. If the Committee's report had come short of his expectations, he could only hope that some other Committee would before long pursue the subject and take it further, and that some day they might have a different report to consider. There were several reasons why he should have liked to have seen the subject pursued. At the tail-end of his remarks, Mr. Penney

gave them one, which he (Mr. Bower) thought would at least have the commendation of some of the members present—that was, that the formation of some basis of remuneration such as profit-sharing, or whatever they liked to call it, would tend to get better results from their employees and working men than were obtained at the present time. With this, he (Mr. Bower) was entirely in sympathy. Taking his own experience (which was going back a few years now), in one part of his career he was remunerated according to the results of the undertaking; and he could look back to that time with a certain amount of pleasure. Not only himself, but those who were working under him were paid by results; and, when they were so remunerated, they got results which had never been obtained since the system was discontinued. It might have been that they were all young men then, and imbued with enthusiasm in the work they had in hand. He thought that in the majority of labour-employing undertakings, enthusiasm was in a great measure secured by the "£ s. d." part of the business. This had always been his impression; and therefore he thought something might have been done on that score. Then again how often they had letters written to them asking what was done at various works in relation to various aspects of the labour question. For instance, a letter would be sent asking how much coal a stoker had to carbonize in eight hours. Another letter would come, asking how much a stoker carbonized per shift, without any regard to the length of the shift—whether eight hours or twelve hours; and the result was that very often unfair comparisons were made as to the quantity of coal carbonized between one works and another, simply because one was on eight-hour shifts and the other on twelve-hour ones. Besides this local circumstances came in—such as scoop or other forms of charging, the close proximity of the coal to the retorts, and so on. All these local circumstances seemed to him to point in the direction that it would be better if they had a Committee who could take such matters up, and formulate for the members some sort of basis to work upon, whereby they could get fair comparisons between one works and another. Then there was this question: So far, he had, in his own case, been able to deal in a very satisfactory manner both with the officials and everybody connected with the Trade Unions; and he did not wish to say a disrespectful word concerning them. He was aware, however, that there had been times when a privilege obtained at one works, or some special consideration, had been used as a whip to obtain similar privileges or something further at other works; and he did not think it was fair that, because the manager of one works considered it was necessary, by reason of local circumstances, for him to grant a certain privilege, that the managers of surrounding works should be called upon to perhaps not only give that concession, but something more. Let them be liberal by all means; it was simply the principle to which he referred that he was opposed to. He did think a Committee of Reference could deal satisfactorily with these and many other questions. It might possibly be that there was some truth in what Mr. Penney had said regarding the unwieldy character of such a Committee; but he (Mr. Bower) thought a preliminary Committee could have been formed, who could have gone deeper into the matter, and looked further afield for information. His feeling was that it would have been better if the Committee, instead of suggesting, as they had done, that the matter be allowed to drop, had left it in abeyance for a time, with the view of getting further information from the members. He thought perhaps sufficient interest had not been taken in the matter to enable the Committee to give a satisfactory report, and members might in the future be disposed to do more in the way of making suggestions and giving information than they had done in the past. He was free to confess that he himself—especially seeing that he was the proposer of the reference to the Committee—had not given the assistance to them that he ought to have done. But he had good reason for this. He had been very busily engaged in the throes of other important work, and had not therefore had time to look thoroughly into the matter. But if the Committee would give him time, he could promise to render them assistance. Therefore he thought it would be desirable, rather than allow the matter to drop altogether, if it were left in abeyance. He could not bring his mind to think that it was impossible to formulate some scheme that would be serviceable. They might even go beyond the labour question; and he would give an example. There were one or two places in the counties of Durham and Northumberland that were offering coke at what he should term ridiculously low prices. These low offers were bandied about by coal exporters and others, and sent to places where the gas-works were obtaining the market value for their coke; and by these means the market price of their coke was forced down. Such tactics as these were not honest; and if they had a Committee in touch with all the managers connected with the Association, to whom they could apply for assistance in such matters, it seemed to him that it would be a decided acquisition. He was perfectly aware that all these questions could not be satisfactorily dealt with by their present staff and organization; but still he thought the Association were now sufficiently influential in the district to pay for the means of disseminating the information. He had not the slightest doubt in his own mind that very great good would accrue not only to his own Company, but to all the gas companies in the district. For these reasons, he should like to see the subject further pursued.

The PRESIDENT said he had been pleased to hear Mr. Bower's address; and, speaking personally, he was thoroughly in sympathy with every word he had uttered. At the last meeting, he (the President) said he quite agreed with the idea Mr. Bower had expressed; and he knew that others were likewise moving in the direction in which Mr. Bower wished to go. He also stated that he was pleased that Mr. Bower looked to the Association for some pronouncement on the matter, as it was following on the lines on which he should like to see the Association made use of. Among the replies, however, to the letter sent out by Mr. Penney was one which called attention to the rules; and Rule 2 said: "The object of this Association shall be the advancement of gas engineering, and the encouragement of discussion of all matters connected with the manufacture and distribution of gas and its products." It was evident by this rule that they were a purely technical society; and if they wished to extend their scope, they would have to make a little alteration regarding the basis of the Association. Mr. Bower, in his remarks, rather strengthened the position of a good many gentlemen who said a difficulty arose over the different conditions existing in the various works; and how could they bring them down to the one necessary level? There were eight-hour and twelve-hour charges, scoop charging, and a thousand different practices occuring in various gas-works. If Mr. Bower wished to move an amendment, he should be pleased to take it; but the report of the Committee was fairly considered and unanimously adopted, and there the matter rested.

Mr. W. HARDIE, jun. (North Shields) regarded the report of the Committee as a very satisfactory one indeed; and he thought the members would do well to adopt it, and to allow the subject to drop. In saying this, he did not wish for one moment to be understood to go against anything that Mr. Bower had said. He practically agreed with every word Mr. Bower had used; but still he thought the cases he had quoted might be met, and met better, in some other way than by the Association taking it up in the unwieldy form in which it must be to make it unanimous. There was so good a feeling through and among all the gas managers of the North of England that, if there was a labour dispute in any particular place, it would be an easy matter for any town to get to know exactly what was done by other works; and the best time he thought to get the information, and the best way to deal with it, was at the moment when it was required. He had had labour troubles, and had asked information of friends round about; and he had found no difficulty in getting it. Their own companies were so dissimilar to other works round about that he thought it would be impossible for any Committee to tabulate the results as to the working and things of that kind, and put them forward as a standard to go by. It would be most unsatisfactory to a great number of works; and instead of doing good to them, it would, he was afraid, do them harm. The same argument applied to the other things Mr. Bower had mentioned. No doubt they felt it was folly for one gas company to sell coke at a price which would force another company's price down. But so far as the local gas companies in the district were concerned, they endeavoured to find out the selling prices of the other local companies, and to work together, so that the one was not put up against the other. These things were, in his opinion, done best in a friendly manner between the individual managers who were affected, rather than taken up by an Association such as theirs. Therefore, he thought the Committee had done wisely in making this report and recommendation.

Mr. S. MEUNIER (Stockport) said this was a subject in which he was deeply interested; and it was one that had struck him more than once as belonging to the Manchester district. Taking the last portion of Mr. Bower's speech first—that referring to the coke question—he might say that he brought it before the Manchester Institution some time ago; but they came to the same ruling practically as the Committee of this Association—viz., that, according to the rules, it was a technical society, and could not take up the work. Some of the members, however, had since practically taken the matter into their own hands, and every fortnight the various works in the Manchester district sent to him (Mr. Meunier) particulars as to their stocks of coke and prices; and a complete copy was forwarded to each works giving the information—not for the sake of settling any particular selling price, not for the sake of dictating what the price should be, but for the sake of information, so that they should all know how the local market was ruling, and how the stocks were going. Having this knowledge, they could, if they thought fit, hold their stocks to keep up prices. Even Manchester, who had been regarded by some people as the *bête noire* of the Manchester district in this respect, had been able to maintain their prices much better than before. This arrangement had obviated a great deal of difficulty; and it seemed to him that something of the kind could be worked in this district. Going from this point, the same idea that Mr. Bower had endeavoured to carry through in regard to the labour question had also struck him; and he had had several talks over it with engineers in the Manchester district. It appeared to him (Mr. Meunier), after reading the Committee's report, that Mr. Bower was aiming for too much. The idea, so far as he could gather, was that they should form a Committee or Federation in order to settle labour questions. That, to his (Mr. Meunier's) mind, was not what they wanted. He did not see how they could do it without going to an enormous amount of trouble, and getting a large organization, which would be unwieldy. But could they not go partially through to the same thing, and endeavour to ascertain the various local circumstances in the district, and formulate from the information some sort of flexible rule if they liked, or some sort of understanding that certain classes of work were worth so much? In this way, they would get the main

prices, because the main prices of gas making were after all very much the same; local circumstances did not vary so much as one would think. Thus, as he had said, they could formulate something which would be useful, and it could be altered to suit the circumstances of a particular undertaking. He considered that something of the kind would have to be done; and, if all of them worked to the same end, they could come to some definite arrangement with regard to obtaining an idea of what any class of work was worth. It would, however, be advisable to go on the liberal side. He referred, in conclusion, to an application which the Stockport lamplighters had made for an advance in wages. At the same time similar applications were made at Oldham, Salford, and Bolton. He and representatives of the other towns consulted over the matter; and they had now altered their scales so as to place them on about the same basis.

Mr. F. P. Tarratt (Darlington) supported the remarks made by Mr. Hardie. He thought the labour question was outside the province of a Gas Managers Association, and that each engineer or manager should be quite capable of dealing with his own labour troubles. It was very easy, as Mr. Hardie had remarked, to obtain information regarding working conditions in the immediate neighbourhood. Respecting the question of coke, that was another matter altogether; and it was an advantage for managers to confer with one another as to its market value.

The President said they had had no amendment to the Committee's report. He did not know whether anything that had transpired during the discussion had altered the view of the members, which certainly seemed to be, from the inquiry made, that the Association should not move further in this matter. He regretted it; but still if it was the view of the members, they must bow to it. He therefore moved that the report be accepted.

Mr. W. Doig Gibb seconded the motion; and it was adopted.

The Election of Officers.

The President announced that the report of the Scrutineers on the ballot for the election of officers was as follows:—

President—Mr. Matt. Dunn, of Goole.

Vice-President—Mr. A. B. Walker, of Walker-on-Tyne.

Auditor—Mr. Herbert Lees, of Hexham.

Secretary—Mr. J. H. Penney, of South Shields.

New Members of Committee—Mr. E. E. J. Anderson, of Ripon, and Mr. F. P. Tarratt, of Darlington.*

The Next Meeting.

Mr. Dunn thanked the members for the honour conferred upon him, and moved that the next meeting be held at Ripon.

This was unanimously agreed to.

The President Thanked.

Mr. J. H. Cox (Sunderland) proposed, and Mr. C. Sellers (York) seconded, a vote of thanks to the President; both gentlemen referring in eulogistic terms to the services of Mr. Millard during his occupancy of the chair.

The proposition having been heartily carried,

The President thanked both the proposer and seconder for the kind words they had used in regard to his efforts, and the members for their cordial endorsement. He had been very glad indeed to do what little he could; and if the interests of the Association had not suffered, that was as much as he could really have expected.

THE NEWCASTLE GAS COMPANY'S NEW HOLDER AT ST. ANTHONY'S.

The business ended, the members found conveyances in readiness to take them to the site of the proposed new works of the Newcastle and Gateshead Gas Company, where a gasholder tank has been erected, and the holder itself (which will have a capacity of 5½ million cubic feet) has been partially constructed.

Before specially dealing with Saturday's visit, it may be interesting to state that the existing works of the Company consist of the Elswick station in the west-end of Newcastle and the Redheugh station at Gateshead—one works being on the north and the other on the south side of the Tyne, and opposite one another. Their productive capacity is respectively 5½ and 10½ millions per 24 hours. In 1900 the increase in the gas produced over 1899 was 7½ per cent. The increase in business in previous years, and the small amount of ground available for extensions at the existing works, necessitated in 1894 the looking out of a new site for a third works. The selected site is that at St. Anthony's, in the extreme East-end of Newcastle, and about 4 miles down the River Tyne from the existing works. The greater part of the ground is exceedingly rough, and covered in many places with large deposits of tank waste; but it was practically the only available site. It has, however, the advantages of having the River Tyne as its south boundary, and a broad new road running into the heart of the lighted district as its north boundary, and of being intersected by the North-Eastern Railway. A Bill was promoted in Parliament and received the Royal Assent in 1896, by which compulsory powers were obtained to purchase the land required; and this, amounting to 69 acres, is now in the possession of the Company. Mr. Gibb has prepared plans for a works of an ultimate capacity of 15 million cubic feet per 24 hours. The works will be in three main sections of 5 millions; each 5-million section being divided into two sub-sections of 2½ millions. The works themselves will be situated between the railway and the river; the ground between the railway and the road to the North being—at present at all events—reserved for gasholders, offices, &c. In a paper entitled "Some Special Features in the Connecting-Mains of a Provincial Gas Company's Stations" read by Mr. Gibb at the Association meeting two years ago, reference was made to this third new station; and it was explained in what way it was proposed to couple it up with the existing stations.

On arriving at the site on Saturday, the members found that nothing had been done there, beyond, as already stated, the completed holder tank, and the partial construction of the holder. The solidity of the tank and the general character of the holder work was much admired; and the complimentary remarks concerning the whole design (the details of which were shown by the exhibition in the tank of fourteen drawings) would, had they all reached the ears of Mr. Gibb, have been sufficient to have completely overwhelmed him. Mr. Gibb did not spare himself in giving full explanations to all who sought them; and Mr. C. H. Abbey (Chief Draughtsman), Mr. Norman Reid and Mr. R. L. Atkinson (pupils), and Mr. C. B. Williamson (Clerk of Works) were plied with numerous inquiries, and assisted in rendering the visit extremely interesting and instructive.

The following among other particulars were gathered. The contracts for the work were let in the latter part of 1898. The tank, which is 239 feet diameter and 45 ft. 6 in. deep, is composed of concrete walls without any puddle backing; and a 9-inch ribbed skin of concrete is carried from the foundations of the vertical walls over the dumpling—concrete steps being worked upon the face of the skin to take the uprights of the tank framing. The contract was let to Mr. Walter Scott; and the cost—including his contract and other work done by the Gas Company themselves—will be in all about £25,000. (The steel tank-framing is considered part of the gasholder.) The tank when full will contain about 7½ million gallons of water. The concrete walls are finished off with a top coping of dressed stone 15 inches deep, and a similar thickness of stone also covers the concrete piers, which are brought right up from the foundations to carry the guide standards. The holder, with a few minor exceptions, is being built entirely of steel, and is in three lifts. The outer lift will be 45 feet deep, and the middle and inner ones 44 feet deep; the diameters respectively being 236 feet, 233 feet, and 230 feet. The crown has no trussing, but will float with the gas pressure when off the fixed framing in the tank. It has a rise of 20 feet. The upper guide-rollers are of the tangential type, with a central radial roller running into the bosom of the standard guides, and a side roller running up the outside faces of same. In the middle and inner lift, the bottom guide carriages form the rest-blocks for the lifts. While the two outer lifts are stayed in the usual way with vertical stiffening bars of Z, channel, and T sections, the inner lift is stiffened by 52 lattice girder stays 18 inches deep; the heads of these being solid plated, and run out the full breadth below the sole-plate of the top guide carriages, and their noses joined together with a strong circular built-up girder. The guide-framing is composed of 26 strongly webbed and plated single lattice girders. These are 135 ft. 6 in. in height. Each one rests upon a cast-iron base, cast in one piece, and weighing about 2½ tons. These in turn rest upon the stone-faced concrete piers. The standards are connected by six rings of lattice girders; the five lower rings being laid horizontally, and the top one vertically—the width varying from 2 ft. 6 in. to 4 feet. A complete system of diagonal bracing also envelops the whole of the framing. The inlet and outlet pipes are built of steel, and are 3 ft. 6 in. internal diameter. The fixed tank-framing to carry the crown of the holder when down is—contrary to the usual practice—made of steel. Special circumstances rendered this advisable. The contract for the holder is in the hands of the Whessoe Foundry Company, Limited, of Darlington; and the cost—including the work done by the Gas Company, &c.—will run out to about £52,000; making the cost of the completed work about £77,000. Unfortunately, it was absolutely necessary to let this contract when prices were high. The whole design, both of the tank and holder, is substantial; since—beyond boring—Mr. Gibb had had no experience of the ground. The situation is an exposed one; and old colliery workings exist below.

Very gratified with their visit to St. Anthony's, the members returned by the same route to the County Hotel, where they dined. Songs and speeches framed in happy phrase contributed to the enjoyment of the occasion.

The Shrinkage of Earthwork was the subject of a brief memorandum from Mr. Alexander E. Kastl, recently read before the American Society of Civil Engineers. He stated that in the construction of the north dyke of the Wachusett reservoir there was a trench 1375 feet long, 500 feet of which averaged 30 feet in depth and 30 feet in width at the bottom. It had 1 to 1 side slopes. This was filled with material found by stripping the surface of an old swamp. The average stripping was about 9 inches in depth, and about 64 acres were gone over in obtaining the material. It was measured by cross-sections taken every 25 feet, on lines at right angles to each other, and was found to amount to 80,355 cubic yards before removal. The material was watered and consolidated with 2-horse groove rollers after being placed in the trench, and the filling was then found to be but 50,735 cubic yards—equivalent to a shrinkage of about 37½ per cent.

* Mr. T. H. Duxbury obtained an equal number of votes to Mr. Tarratt; but the President gave his casting vote in favour of the latter gentleman as he had been a member of the Association longer than Mr. Duxbury.

CHEMISTRY AND ENGINEERING.

The theatre of the Institution of Civil Engineers was, on Thursday evening last, once again a centre of interest for the gas profession; the occasion being the delivery of the ninth "James Forrest" lecture. The subject this year was "Chemistry in its Relation to Engineering," and the lecturer was Professor Frank Clowes, D.Sc. In introducing him to the meeting, the President of the Institution reminded his hearers of the origin of this series of lectures—established, it will be remembered, by the present Honorary Secretary, Mr. James Forrest. Dr. Clowes, as is well known, is Chemist to the London County Council, and was formerly Principal at University College, Nottingham; and it will not be forgotten that he was the chief guest at last year's dinner of the Institution of Gas Engineers.

The lecturer, in opening his subject, emphasized the close connection existing between chemistry and engineering. Accepting the broad definition of the engineer as one whose function it is to utilize the forces of Nature in the interests of mankind, it will at once be manifest that of the several natural forces of which he has to take advantage, the chemical force will be the one with whose action and products the engineer is perhaps most constantly brought into relation.

A large number of comparisons between the engineering curricula of various colleges was then given, and the results obtained epitomized. First, the study of chemistry, both theoretical and experimental, by the engineering student is highly desirable, and should be made compulsory, if possible. Accordingly, most of the institutions provide time for the study of chemistry in their engineering curricula; a few give much attention and time to training the engineering student in general chemistry; while a small minority feel that they must be content for the present to recommend the study without making it compulsory. Secondly, regret is generally expressed that the engineering curriculum is too full to permit of a much more satisfactory chemical training being insisted upon. Thirdly, especial stress is laid on the value of experimental work in the chemical laboratory. Fourthly, the general curriculum should include: The experimental demonstration of general chemical laws and principles, as illustrated by a study of some of the more common elements and compounds. The chemical nature of pure and natural water; the relation of hard water to the waste of soap and to the production of boiler scale, and the explanation of softening processes. The chemical nature of air, and of the changes which are produced in it by breathing and by combustion. The composition of fuel—gaseous, liquid, and solid. The chemical study of combustion in air, both complete and incomplete, and of the products which are formed. A similar study of the common explosives and their products. The general principles of thermochemistry and of calorimetry. The general methods employed in smelting metal ores, and in making alloys. Simple qualitative and quantitative analysis, including an experience sufficient to enable the student to understand the results of the analyses of natural water, of sewage and sewage effluent, of fuel, of flue gases, of lubricating oils, of cement, bricks, and building stones, and of iron, steel, and the common alloys.

It will be seen from this that a large amount of ground is covered; and the aspirant to engineering honours will find his time fully occupied in this important branch of his studies, which is but one among others. However, Dr. Clowes somewhat reduces it for the average engineering student, and says that: Probably all that can be expected of the average engineering student is that he shall become generally conversant, during his college course, with chemical language, with chemical principles and laws, and with the chemical nature of the materials with which he has to deal; and that he should obtain such an insight into chemical analysis as to be able to confer with the trained chemist, and to understand the meaning of a general statement of the results of chemical analysis bearing on metals, alloys, fuel, lubricants, cements, and other materials which are frequently used by the engineer. The gas engineer, however, whose training is at present being so much discussed, and the gas student, for whose welfare so much concern is expressed, must certainly undertake in their studies a far larger amount of chemical work than falls to the lot of the ordinary engineer. Particularly must this be so if they wish to fit themselves for the highest positions in the profession of their adoption, and if they desire to see removed the stigma of lack of enterprise in the more abstruse research of their calling, to which reference has frequently been made in these columns.

Dr. Clowes then proceeded to examine some departments in which engineering had received considerable assistance from chemical coadjutors. The first one was naturally that concerned with constructive materials, such as cheap steel. The original production of Bessemer steel from the pure Swedish cast iron was undoubtedly suggested by accurate chemical analyses which showed the relative chemical composition of cast iron, wrought iron, and steel. The process owed its original suggestion, as well as its salvation from failure, to the chemical knowledge which was supplied to those who were interested in the procedure. Some original photographic views of the Bessemer process, taken during actual operations, were exhibited.

The second instance cited was that of gas making and gas-works. The lecturer said: It is scarcely necessary to point out the absolute necessity of chemical knowledge and chemical advice to the gas engineer. The engineer who designs and superintends in use the plant for making the various forms of gaseous fuel which are required for heating and lighting purposes, requires to keep abreast of chemical progress in these departments; and he will be seriously handicapped if he endeavours to proceed unaided and unadvised by the chemist, and if his products are not frequently subjected to chemical examination. Here it may be noted that Germany employs many more chemists in connection with engineering works generally than England; and especially is this so as regards gas manufacture. The imperative importance of having chemists and chemical laboratories on British gas-works, of both large and medium size, cannot be too often or too strongly insisted upon. The more collaboration there is between chemists and gas engineers, the better for our industry; and the thinner the dividing line becomes between chemical engineers and engineering chemists, the better will be the commercial prospects of our country.

Water-works and water supply provided another example for insistence upon the co-operation of the chemist. The design and construction of water-works is pre-eminently an engineering undertaking, and includes not only the provision of suitable borings, conduits, storage reservoirs, and pumping-stations, but also of suitable and satisfactory filter-beds when necessary. But here, again, if the health and requirements of the consumers of the water supply are to be properly considered, the chemist must determine the character of the water source from which the supply is to be derived; and he must also constantly examine the water as it is supplied to consumers in order to ascertain whether its bacteriological condition is satisfactory.

Following this, sewage treatment and purification obviously afford an even wider field for chemical investigation. "Neither the engineer nor the chemist, alone and unaided, is the proper person to deal with the disposal of the sewage of our towns." . . . It must be remembered that the processes by which the purification of town sewage has been accomplished, and has been from time to time improved, have invariably been evolved, directly or indirectly, by the chemist, and depend on chemical investigation, checked by the results of chemical analysis. It should further be borne in mind that when any process of treatment has been established on the large scale, the results of its working—as in the parallel cases of gas-works and water-works—must be constantly checked by chemical examination of the products. Valuable experimental work on the natural or bacterial treatment of sewage has been carried out in many towns; but Manchester leads the van, followed by London and Leeds. Exceedingly interesting lantern slides of sewage bacteria, which were actual photographs taken from the microscope, were thrown upon the screen. Some of them showed the developments and changes which take place in coke purification tanks.

The last instance given of successful interaction between engineer and chemist was that of the means devised for the detection and estimation of inflammable gas and vapour in air. The lecturer, having lived in the neighbourhood of collieries in the Midlands, naturally felt much interested in the application of the Davy safety lamp for lighting and gas testing in coal mines. Fire-damp was originally (and is still) detected by its power of causing a conical pale flame, known as a "flame-cap," over the reduced and almost non-luminous flame of the lamp. Dr. Clowes here carried out a very successful experiment of producing a flame-cap, which was easily visible by all present. He then described his investigations and improvements upon this principle; and then he showed a modern lamp, with a small oil-flame for ordinary lighting uses, and an attached cylinder of compressed hydrogen for testing by the flame-cap method. It was found possible not only to detect as small a proportion of fire-damp as 0·25 per cent. in the air by this means, but also to measure the proportion of gas present until it reached the explosive proportion. The measurement was secured by setting the hydrogen flame to a standard height, and then noting the height of the flame-cap by means of a properly-constructed scale fixed inside the lamp. This combined oil and hydrogen lamp has been found of use to mining engineers; and the hydrogen flame-cap test has also been adopted for the detection and measurement of petroleum vapour in air. This is particularly of utility, when petroleum tanks and vessels have to undergo repair. The exact state of the atmosphere inside them can be arrived at, and absolute safety therefore secured for the men whose duty it is to execute the repairs required. In a similar way, the instrument was also used for detecting the constituents of the gases under pavements, after electrolytic explosions had occurred, such as were pretty frequent a few years ago.

In concluding, the lecturer said he had only been able to deal with the subject in the barest outline. "It is true," he said, "that as knowledge advances, it becomes increasingly difficult for the engineer or the chemist to learn much of any department of knowledge except that which most nearly concerns him. But this fact renders it the more necessary, in the interest of progress and success, that the members of these two important professions should heartily co-operate, and should place at each other's disposal the knowledge and advice which each may be able to offer. Such co-operation of the engineer with those who have specially devoted themselves to the various natural sciences will help this country to maintain that glorious prestige amongst the nations which the noble labours of a long succession of great engineers have conferred upon it."

The lecture proved, as was generally admitted, one of the best

of the series. It is certainly one that gas engineers in particular should seriously consider, and profit by. Our thanks are therefore due, in an especial degree, to Dr. Clowes, to whom we cordially offer them for his interesting and valuable lecture.

WATER GAS AND OTHER COMBUSTIBLE GASES.

By Herr JOH. KÖRTING, of Hanover.

[Abstract Translation of a Communication to the Association of German Engineers.]

When water gas is spoken of in technical circles, the term is frequently confused with the name of some other fuel gas—such as Dowson gas. The following lines have been written with a view to throwing some light on these gases, and indicating the places they severally hold according to present knowledge.

If suitable fuel is piled up in a furnace and lighted, and burned from the base by the application of a blast of air, it depends on the height of the bed of fuel, the description and size of the fuel, as well as on the strength of the blast, whether the combustion will be complete or incomplete. It is complete if carbonic acid only is obtained from the carbon consumed. If it is incomplete, combustible products—in particular, carbonic oxide—remain in the escaping gases. The incomplete combustion can be pushed so far that the products contain very little carbonic acid, but so much carbonic oxide that the gas produced can be utilized by further combustion. The furnace has then become a producer; and the effluent gas is known as producer gas or Siemens gas. Such gas has been known for years, and extensively applied in many industries. Blast-furnaces, as magnificent producers of the largest description, rank at the head of this class.

Producer gas has the following composition:—

Carbonic oxide	23 to 30 per cent.
Carbonic acid	2 ,, 7 ,,
Nitrogen	50 ,, 65 ,,
Hydrogen	2 ,, 6 ,,

In addition, there are small quantities of marsh gas, oxygen, &c.

If a certain amount of water is mixed with the air of the blast, either as steam or as spray—by the use, for instance, of a steam-jet air-blast in place of a fan, blower, or similar apparatus—then there is obtained in the producer gas, owing to the decomposition of the injected steam, a certain quantity of hydrogen. This raises the heating value of the gas produced, and also the duty obtained from the fuel. The gas formed under such conditions continues to be a producer gas; but when it is produced in the specially constructed producers which have been much used for the provision of power, it is known as power gas (or Dowson gas, mixed gas, or semi-water gas). The composition of this gas is—

Carbonic oxide	23·0 to 27·0 per cent.
Carbonic acid	6·0 ,, 7·0 ,,
Hydrogen	17·0 ,, 18·0 ,,
Nitrogen	47·0 ,, 52·0 ,,
Marsh gas	0·5 ,, 2·0 ,,

If, with a furnace or producer operated with a dry blast of air, the blast is stopped when the fuel has become thoroughly incandescent, and steam only is then sent through it, water gas is formed. The steam injected is decomposed; and the oxygen thus liberated combines with the carbon to form carbonic oxide at high temperatures, or carbonic acid at low temperatures. Water gas therefore consists of hydrogen with which should be mixed as much carbonic oxide and as little carbonic acid as possible. The production of water gas must therefore be interrupted as soon as the temperature of the fuel has been so much lowered by the injected steam that the production of carbonic acid has become too great. Dr. Hipper, of Bremen, found that the percentage of carbonic acid in the gas after the steam had been admitted for the number of minutes named was as follows:—

Minutes	1	2	3	4	5	6	7
Carbonic acid	0·4	2·0	3·1	4·7	6·7	8·9	9·9

After the water-gas making has been interrupted, the bed of fuel must be raised again to incandescence by the blast. Therefore water-gas production comprises intermittent operations—viz., (1) Blowing the contents of the producer or generator to incandescence, and (2) producing water gas with consequent cooling of the contents of the generator. The manufacture of producer gas or of power gas, on the other hand, is one that proceeds uninterruptedly. Water gas in practice has about the following composition:—

Carbonic oxide	40 per cent.
Carbonic acid	3 to 7 ,,
Hydrogen	50 ,,
Nitrogen, &c.	3 to 6 ,,

Coal gas, being made by dry distillation, differs considerably from the gases already described. It differs in composition according to the description of coal carbonized. The gas from Westphalian coal has the following composition:—

Hydrogen	46 to 48·0 per cent.
Carbonic oxide	6 ,, 8·0 ,,
Carbonic acid	1 ,, 1·5 ,,
Heavy hydrocarbons	3 ,, 5·0 ,,
Marsh gas	34 ,, 38·0 ,,

If the coal is not distilled in retorts, but in ovens in direct contact with the fuel, coke-oven gas is produced. It varies greatly in composition according to the construction of the oven. One analysis gives the following result:—

Carbonic oxide	about 0·7 per cent.
Hydrogen	,, 22·5 ,,
Carbonic acid	,, 5·0 ,,
Marsh gas	,, 19·0 ,,
Nitrogen	,, 44·0 ,,

Though coke-oven gas will not be considered in the sequel, it has been mentioned for the sake of completeness, and because it may in the future become of very great importance. The demand for coke constantly increases; and the working of the ovens is being so improved that gas obtained from them is equalling coal gas in calorific value.

For the production of producer gas, Dowson gas, and water gas, highly carbonaceous non-bituminous fuel, such as coke or anthracite, is preferable, as it yields gas which is readily purified and is free from tarry constituents. If bituminous coal is employed for making water gas in the simple generators, the valuable gases which it liberates are lost in the producer gas or flue gases. But there are generators of special construction for rendering the bituminous constituents available in the water gas. For coal-gas manufacture, on the other hand, highly bituminous coals, as dry as possible, are employed. Those types of gases, however, which contain little or none of the bituminous products—viz., marsh gas and heavy hydrocarbons—burn with a blue or bluish green flame without illuminating power. Further comparison of the types of gas indicates that water gas contains a very large proportion of carbonic oxide, which is highly poisonous; while producer gas and Dowson gas contain only about half as much, and coal gas still less. This constituent accounts for the poisonous qualities of water gas, which is the more dangerous because it is odourless.

Coal gas, however, is none the less poisonous; for marsh gas and heavy hydrocarbons have high poisoning properties. But its peculiar strong smell makes an escape easy of detection, and so reduces the danger. If water gas is to be used for lighting purposes, this quality of coal gas must be imparted to it artificially by the addition of some scented agent—such as mercaptan, carbylamine, acrolein, or thiacetone. Water gas may, however, be, employed in factories for technical uses without such precaution, if the installation is carefully carried out. Producer gas and Dowson gas are less poisonous. They are never used for town supplies. They have been used for years on works without harm ensuing. The sulphuretted hydrogen which they contain imparts an odour to them, which, however, is less powerful than that of coal gas.

With regard to the harm which may ensue by the distribution of odorized simple water gas in towns in place of coal gas, extensive experience has not yet been obtained. We must agree, however, with the statement made long ago by Professor F. Fischer, to the effect that the step from the tallow candle or oil-lamp to coal gas was a million times greater than will be that from coal gas to water gas. In regard to risk from explosion, water gas appears favourably; for 6 to 9 parts of coal gas per 100 parts of air constitutes an explosive mixture, while with water gas as much as from 12 to 14 parts per 100 of air are required.

Of the gases named above, water gas affords the highest heat on combustion—viz., 4900° to 5100° Fahr.; while coal gas affords only 4200° to 4300° Fahr., and Dowson gas and producer gas less than 3600° Fahr. The heat developed can, of course, be increased by the aid of pre-heated air and combustion at high pressure. Water gas is of the greatest importance in industries where very high heat is required. From this property of water gas also comes its peculiar suitableness for Welsbach lighting. The Welsbach light first caused attention to be drawn to the use of simple water gas for the supply of light and heat in towns; but we must look to the future to ascertain to what extent the hopes raised thereon will be fulfilled. There are many considerations, however, with regard to the use of water gas. Both during manufacture, and while in the mains, the carbonic oxide which it contains combines with iron to form iron carbonyl, which produces a reddish brown deposit on Welsbach mantles, and rapidly spoils them. The iron compound produced in the making can, according to some, be removed by treating the gas with sulphuric acid. The formation of the iron compound in the mains is said to be prevented by coating them internally with asphalte, or by galvanizing them. Another objection to the supply of simple water gas is that consumers must be prepared to use only Welsbach lights, as the use of open flames for lighting is, of course, out of the question.

Water gas in the Welsbach burner is stated to afford an average illuminating power of nearly 66 candles for a consumption of 5·3 cubic feet per hour. According to Herr von Oechelhaëuser, coal gas in the Welsbach burner gives a light of 49 candles for a consumption of 3·5 cubic feet per hour—that is to say, water gas has a lighting duty of 12·5 candles per cubic foot, and coal gas of 14 candles per cubic foot. But the heat used up in the development of the same light is very much greater in the case of the coal gas than of the water gas. Dowson gas and producer gas cannot be used for the Welsbach light; and they therefore pass out of consideration for lighting purposes. It is to be remarked, however, that the advances of the Welsbach light have drawn attention to the question of the distribution of coal gas of lower illuminating power, which could be made from less highly bituminous coal than that now usually carbonized. In fact, experiments have shown that a reduction of the illuminating power in open-flame burners from 14 to less than 2 candles

is attended with an increase in the illuminating power of a Welsbach light from 66½ candles to 73½ candles.

With reference to the heating value of the different kinds of gas, that of coal gas is the highest; being from 136 to 147 calories per cubic foot. The calorific power of water gas is about half this—viz.. from 66½ to 73½ calories per cubic foot; that of Dowson gas about a quarter, from 34 to 39½ calories per cubic foot; and that of producer gas is from 24 to 28 calories per cubic foot. In order to obtain the same heat or power, the consumption of the poorer heating gases increases in the ratio indicated as compared with coal gas. According to the figures given for the Welsbach light, for every candle of illuminating power, about 10¼ calories with coal gas or 5¾ calories with water gas would be needed.

The specific gravity of coal gas averages ·4; that of water gas ·51; that of Dowson gas about ·83; that of producer gas about 1. For the poorer heating gases, therefore, a greater cross section is requisite for the distribution of the same volume of gas under the same pressure. Having regard also to their lower calorific power, this cross section must be still further increased to allow of the passage of the quantity of gas required to afford the same quantity of heat. The mains, which will convey the like amount of energy, must be considerably larger in diameter, and be therefore more costly, for water gas than for coal gas.

The circumstance that, until recently, illuminating gas (in open-flame burners) could not be dispensed with, has led to illuminants being added to water gas to fit it for town supplies. This has been done most extensively in North America, where anthracite from which the water gas can be made, and petroleum residues, which serve to give it illuminating qualities, are at hand and comparatively cheap. This carburetted water gas is more used than coal gas in North America; and it is made of a higher illuminating power—viz., about 24½ candles, instead of the 14-candle power to which we are accustomed with coal gas. [Where 14-candle power gas is spoken of throughout this communication, gas having an illuminative value of 14 English candles (16 Hefner units) when burnt in a batswing burner at the rate of 5·3 cubic feet (150 litres) per hour is referred to.] Such carburetted water gas has the following composition:—

Carbonic oxide	23·0	to	28·0	per cent.
Carbonic acid	0·2	,,	2·2	,,
Hydrogen	34·0	,,	38·0	,,
Nitrogen	2·5	,,	5·0	,,
Marsh gas	17·0	,,	21·0	,,
Heavy hydrocarbons	13·0	,,	16·0	,,

Its specific gravity is ·58 to ·60; and it has a calorific power of about 170 calories per cubic foot.

In Germany, this carburetted water-gas process is only employed in gas-works which are not equal to requirements, as a simple and quick means of supplementing their output. The carburetting agent is too dear for the process to be employed exclusively. There are few sources of suitable oils in Germany; and their production is limited. Water gas of 14-candle power produced by means of paraffin oil has a specific gravity of ·58; and a calorific power of 139 to 144 calories per cubic foot. Such gas therefore would correspond closely with coal gas in respect of calorific and illuminating power. About 400 grains of such oil per hour afford an illuminating power of 1 candle.

A second means which has been proposed for rendering water gas illuminating appears to present great practical difficulties. This is carburetting it with benzol in the cold. Apart from the high cost of water gas thus carburetted to 14-candle power, it has the defect that the benzol is thrown down in the mains. This happens most rapidly when the gas and surrounding air are cold; and with this deposition of the benzol, the illuminating power of the gas likewise departs. The gas, moreover, is inclined to burn with a smoky flame. The quantity of benzol required to afford a given illuminating power depends on the proportion of carbonic acid in the gas, but on the average is about 140 grains per candle. Water gas thus carburetted to 14 candles has a calorific power of about 105 calories per cubic foot; and as a heating gas, it has therefore only about three-quarters the value of coal gas. Its specific gravity is about ·6.

More important is the mixing of water gas, feebly carburetted with benzol, with coal gas in order to form a mixed gas. In this case, the benzol is not thrown out again, provided the quantity used is not too great. This process is used at Königsberg, where 20 per cent. of water gas, carburetted with about 9½ grains of benzol per cubic foot, is added to the coal gas.

(To be continued.)

Gas Coal in Borneo.—Some account of the prospects which have presented themselves in connection with the opening up of a new coalfield in Borneo have recently appeared in the "British North Borneo Herald." A workable coalfield was discovered by Mr. E. H. Phillips, who has been engaged by the Sandakan Bay Coalfields Company, and who is now, it is stated, going to commence work on a large scale. This coalfield is situated on the east coast, about 12 miles west of Cowie Harbour, in the valley of the Surndong. Samples of the coal have been found to contain 44·5 per cent. of volatile matters, 48·5 per cent. of fixed carbon, 4·1 per cent. of ash, 0·5 per cent. of sulphur, and 2·4 per cent. of water It is a remarkably pure coal—the proportions of sulphur, ash, and water being low; while it contains an exceptionally high percentage of volatile matter, and is therefore specially valuable for the production of illuminating gas. Owing to its hardness, it promises well to withstand the wear and tear of transport.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

The Coal Export Duty.

SIR,—In your editorial on the Budget proposals this week, you say that "the arguments of the scholastic economists as to who will pay the money in each case"—that is the sugar and coal taxes—"counteract each other." Is that so? The political economist, I think, would tell you that the *ultimate* consumer would pay in each case, which is a different thing from saying that "the consumer" would pay.

In the case of sugar, those purchasers who buy for their own personal consumption will pay the duty; those purchasers who buy sugar as a raw material to be used in the manufacture of jam, biscuits, confectionery, &c., will eventually charge the duty upon their customers. In the case of coal, which is used mainly in the manufacture of goods, the foreign purchaser will pass the enhanced cost on to the consumer of the manufactured article. That consumer will in many cases be British. In so far as the enhanced cost of the manufactured article leads the British consumer to buy in the home instead of in the foreign market, the coal tax will be protective, which the sugar tax is not. To make the German iron-maker pay 1s. per ton more for his fuel is equivalent to imposing an import duty of 2s. 6d. per ton on German iron.

An export duty on coal is a departure from Free Trade principles. There is no disputing that, whatever view one may take of the wisdom or the folly of such a departure. And surely it is rather short-sighted patriotism—savouring of the "d—d foreigner" attitude which is so contemptible in John Bull—to rejoice at the happy idea of making the foreigner pay some of our military expenses. What would the full-blown Jingo say if France stuck an export duty on champagne, with the avowed intention of making us pay for her army?

A noteworthy commentary on your remark that it would need 10s. per ton duty to turn the scale in favour of European as against English coal—a 10s. duty would simply mean absolute disaster both to the trade of this country and that of the Continent, and anyone who doubts it has not thought the matter out—is the announcement that the German coalowners propose raising their prices 1s. a ton to their consumers. And what do these figures mean if English coal needs a handicap of 10s. per ton before the scale is turned in favour of European?

Exports of English Coal.

To	1899.		1900.
Austria-Hungary	224,100 tons.	..	144,497 tons.
Greece	335,594 ,,	..	267,421 ,,
Roumania	207,976 ,,	..	69,579 ,,
Turkey	461,797 ,,	..	367,121 ,,

A falling-off in our exports to the above four countries of over 30 per cent. in spite of coal being, in the greater part of the year, scarce and dear in Germany.

It is only yet another disastrous result of last year's coal "boom" that it should have reconciled the general public, and the Press that is supposed to "educate" public opinion, to the abandonment of sound principles of finance and trading that is involved by the imposition of a coal duty. If at the same time as she enters upon a period of severe trade competition with her foreign rivals, Great Britain enters upon a policy of restriction and protection, we shall soon be landed in such a mess as will require a statesman who understands, and will not be afraid to apply, the principles of scholastic political economy to pull us out.

April 26, 1901. FREE TRADER.

Mr. Young's 6·4d.

SIR,—In looking through this interesting paper, I have some doubts as to whether I understand Mr. Young aright. For instance, Mr. Young takes as a text: "It is a well-known fact that the profits of a gas company depend mainly upon the quantity of gas they manufacture and supply." Would it not be safer to add to the text, "At a profit"? Or is this to be understood?

I could name several companies who sell to some favoured consumers at the average cost price, and others who sell at even less than the average cost price. Can so doing increase the profits; and can such a price be based on sound business principles?

To state a case. I am connected with a works which in 1896 sold 16 per cent. of its gas at a loss; in 1900, it sold 32 per cent. at a loss. The profit was less in 1900 than in 1896. Is this to be wondered at?

Mr. Young gives the cost of manufacture per 1000 cubic feet sold exclusive of raw material: In 1897, 9·7d.; in 1900, 6·3d. I should like to ask Mr. Young exactly how these figures are made up, as the allocation of charges does make such a lot of difference in any comparison of this kind.

The reduction of standing charges in Mr. Young's case is truly extraordinary. It would be interesting for those of us who do not expect great things from slot consumers, if Mr. Young could give an idea of the reduction he would expect in his standing charges, supposing he were to still retain his 5733 ordinary consumers, and increase his slot consumers to 12,388; together with the basis of such expectations.

I should be most obliged if Mr. Young would kindly help me to follow his figures, as I may then be led to follow his good results.

GEO. HELPS.

Nuneaton, April 25, 1901.

Gas at the Glasgow Exhibition.

SIR,—We observe in this week's issue a communication in which reference is made to the forthcoming Glasgow Exhibition, and the hope is expressed that advantage will be taken of this opportunity of placing before the visitors the present possibilities of gas for use in the houses of the people.

It will interest your numerous readers to know that we are fitting up

a portion of our stand as a model kitchen, showing the application of gas for cooking, laundry work, and the supplying of hot water.

We have had in view the important question of educating our architects and builders in connection with this matter. The gas-cooker has now established itself as a necessity of modern life. It is, therefore, time that those who design our houses should make sensible and necessary provision in the kitchen for gas-stoves. In this model kitchen, we have recognized the fact that a small coal-fire is also a necessity for winter use; and we are showing how the combination can be arrived at in a simple and effective manner.

R. & A. MAIN, LIMITED.

Glasgow, April 25, 1901.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons and read the first time: Gravesend Gas Bill, Honley Urban District Council Gas Bill, Leatherhead Gas Bill, Petersfield and Selsey Gas Bill.

Bills reported, with amendments: Chester Gas Bill, Otley Gas Bill, Sheffield Corporation Bill, Sutton-in-Ashfield Urban District (Water) Bill.

Bills read the third time and passed: Alfreton Gas Bill, Aspatria, Silloth, and District Water Bill, Oakham Water Bill, Omagh Gas Bill.

The South Essex Water Bill has been referred to a Select Committee, consisting of Lord Ribblesdale (Chairman), Lord Abinger, Lord Carew, Lord De Mauley, and Lord Ludlow; to meet on Wednesday, May 1.

The opposition to the Chester Gas Bill, the Harpenden District Gas Bill, the Newport (I.W.) Gas Bill, the Smethwick Corporation Bill, and the Weston-super-Mare Gas Bill has been withdrawn.

A Bill to amend the Alkali, &c., Works Regulation Act, 1881, has been brought in by Lord Kenyon, and read the first time.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Alfreton Gas Bill, Aspatria, Silloth, and District Water Bill, Oakham Water Bill, Omagh Gas Bill.

Bills read a second time and committed: Arlesey Gas Bill, Newcastle-upon-Tyne and Gateshead Gas Bill.

Bills reported, with amendments: Horley District Gas Bill [Horley and Crawley Bills consolidated], Ilkeston and Heanor Water Board Bill, Long Eaton Gas Bill, Tendring Hundred Water Bill, Wells Corporation Water Bill, Wells Water Bill [parties do not proceed].

Bills read the third time and passed: Colwyn Bay and Colwyn Urban District Gas Bill, Gravesend Gas Bill, Honley Urban District Council Gas Bill, Leatherhead Gas Bill, Petersfield and Selsey Gas Bill.

The Bingley Urban District Council Bill, Bradford Corporation Bill, Bury Corporation Bill, Rhyl Improvement Bill, and Shipley Improvement Bill have been referred to a Select Committee, consisting of Mr. Heywood Johnstone (Chairman), Sir J. Leigh, Mr. J. W. Wilson, and Mr. Soames; to meet on Tuesday, April 30.

The Blackburn Corporation Bill, Burton-upon-Trent Corporation Bill, Derby Corporation Bill, and Mansfield Corporation Bill have been referred to a Select Committee, consisting of Mr. Bill (Chairman), Sir G. Fardell, Mr. Trevelyan, and Mr. Eugene Wason; to meet on Tuesday, April 30.

Ardrossan Gas and Water Bill.—This Bill was considered before the Commission under Scottish Private Procedure Act at Ayr, last Wednesday. The Bill seeks power to extend the gas and water works (already in the hands of the Corporation) at a cost of £31,000. The only opponents were the Ardrossan Harbour Trustees, who objected to being brought within the rating areas, and whose opposition was confined solely to being included in the rating areas. No evidence on the subject was, however, placed before the Commissioners. After some consideration, the Court held that the preamble of the Bill was proved if certain legal rights were conserved to the owners of the harbour of Ardrossan. It was accordingly agreed to frame a clause giving effect to this suggestion; and the preamble of the Bill was thereupon passed.

Elland Gas Bill.—The promoters of the Elland Gas Bill, seeking to introduce an additional provision, the matter came last Tuesday before the Examiners of the House of Lords for proof of compliance with the Standing Orders. The provision in question (consequent on the extension of the borough of Halifax) transfers the powers of the Elland Gas Company, so far as the parish of Skircoat is concerned, to the Halifax Corporation; the consideration paid by the latter to the Company for the transfer being £1100. The Examiners decided that the Standing Orders had not been complied with, inasmuch as the necessary notices had not been given in time. The matter will therefore have to go before the Standing Orders Committee, who will decide whether the Orders may be dispensed with. When the Bill reaches the Select Committee stage, the District Council will offer strenuous opposition unless certain substantial concessions (including an option of purchase) are granted. Negotiations which have been proceeding between the Council and the Company have up to the present failed to produce any satisfactory agreement; and the Council have now decided that an offer of £125,000 be made to the Company for their undertaking and all their assets—the Company to pay their own debts and liabilities. If this offer is not accepted, the Council will persist in their opposition.

HOUSE OF COMMONS COMMITTEE.

Friday, April 26.

(*Before Colonel* WELBY, *Chairman, Mr.* LLOYD MORGAN, *Mr.* PLUMMER, *and Mr.* SOARES.)

MOND GAS BILL.

This Bill, which was promoted to incorporate and confer powers on the South Staffordshire Mond Gas Power and Heating Company, and for other purposes, came before the above Committee to-day.

Mr. BALFOUR BROWNE, K.C., Mr. WALLACE, K.C., Mr. BAGGALLAY, K.C., and Mr. GERALD FITZGERALD appeared for the promoters. The petitioners in opposition were represented as follows: Bilston Gaslight and Coke Company, by Mr. HONORATUS LLOYD; Dudley Gaslight Company, by Mr. ARNOLD STATHAM; Willenhall Gas Company, by Mr. PEMBROKE STEPHENS, K.C.; Wolverhampton Gas Company, by Mr. E. MOON; Midland Electric Corporation for Power Distribution, by Mr. C. F. PRITCHARD; West Bromwich Corporation, by Mr. RAND, K.C., and Mr. GREIG; Smethwick Corporation, by Lord ROBERT CECIL, K.C., and Mr. W. SHAKESPEARE; Walsall Corporation, by Mr. WEDDERBURN, K.C., and Mr. COURTHOPE MUNROE; Birmingham Corporation, by Mr. POPE, K.C., Mr. FREEMAN, K.C., and Mr. HONORATUS LLOYD; Oldbury Urban District Council, by Lord ROBERT CECIL, K.C., and Mr. W. SHAKESPEARE; Handsworth Urban District Council, by Mr. HUGO YOUNG, K.C.; Stourbridge Urban District Council, by Mr. C. C. HUTCHINSON; and Halesowen and Kingswinford Rural District Councils, by Mr. J. J. PARFITT. Counsel was reserved also on behalf of the Brierley Hill Gas Company and the Tipton and Sedgley Urban District Councils.

Mr. BALFOUR BROWNE, in opening, said the promoters of the Bill were all gentlemen more or less deeply interested in the industries carried on in the particular district affected. Dr. Ludwig Mond was the inventor of the gas, which was a power and heating gas, not an illuminating gas; and he was to be a member of the Company. The gas could not be used for illuminating purposes. It had a flame exactly like what was produced from spirits of wine—practically non-illuminating. It was suggested by some of the petitioners that probably, by means of some mantle, light might be obtained—that the glowing of the mantle might give light. No one could say what would happen in the future; but there was no burner or mantle at present which could turn Mond gas into an illuminant. The object was not to supply gas for lighting purposes; and therefore, although a number of Local Authorities were opposing because they were afraid of competition with their existing gas-works, he did not think their fears were well founded. But he believed the promoters would go further, and consent to a provision that they were not only not to supply gas for illuminating, but were not to supply it for domestic purposes—such as for cooking-stoves. This gas had one great advantage over other producer gas, in that in its manufacture the sulphate of ammonia was recovered as a bye-product. This was one of the features which enabled the promoters to supply the gas at a very low cost. Sulphate of ammonia was valuable as a fertilizer for agriculture—in fact, more valuable than Chili nitrates. The result was that, if they made the gas from coal or slack (the latter being the cheapest kind of coal), at a cost of 6s. a ton, sufficient sulphate of ammonia would be recovered to return about 4s. 6d. a ton. In this way, the cost for coal which would fall on the gas would only be 1s. 6d. per ton. Producer gas differed from ordinary gas in its manufacture and composition. Mond gas was produced entirely differently from ordinary coal gas. A mixture of air and steam was forced through ignited slack placed in hoppers; and the whole of the combustible matter in the slack, including the coke, was converted into gas. So that in another respect Mond gas had an advantage over coal gas, because with coal gas the coke (which was combustible) was not so turned into gas. A further advantage of producer gas was that it could be made from inferior, and therefore cheap, descriptions of coal. The manufacture of the gas was not in the experimental stage; for it was being produced to-day at several works, and especially at those of Messrs. Brunner, Mond, and Co., in Cheshire. Practically, the only reason the Company were applying to Parliament, was that they needed power to break up streets and roads, as in the case of gas, water, electric light, and electric power companies. The chief uses of Mond gas were directly and indirectly for motive power in all cases where steam was used, and in all heating operations. It was especially useful where the flame had to be brought into direct contact with the matter to be heated, which was essential in many manufactures—such as bricks, glass, china, glazed earthenware, &c. In the manufacture of open-hearth steel, it produced better results than any at present obtained, for it contained less sulphur than ordinary gas. As it could be turned on or off at will, there was absolutely no waste. It was quite certain that gas-engines were the engines of the future; and one great advantage offered by the Company was in regard to small manufacturers, who hitherto had not been able to get power as cheaply as large ones. The Company would be able to supply them with power and heat at prices very much below those of electricity. In conjunction with gas-engines, this gas would be greatly superior to steam. So far, gas-engines had not had fair play with ordinary gas. Ordinary gas was produced for illuminating purposes; and it had to be enriched until it was of 14, 15, 16, or more candle power. This made it costly, and at the same time unfitted it for use in engines. With the assistance of Mond gas, however, the Company would be able to produce power at a marvellously low rate; and they could compete successfully with coal gas of even as low as 10-candle power. Mr. George Beilby, the President of the Society of Chemical Industry, said, in an address which he delivered in 1899, that it was rather striking that the 5 million horse power at present developed by steam-boilers, with a consumption of 50 million tons of coal, might be developed by Mond producer gas-engines with a consumption of only 10 million tons. If this was true, there would be a tremendous gain to the country by the use of this gas. A number of firms had already adopted it. But each had to have separate plant; and therefore the cost was greater than it would be if it were supplied by the Company, who would manufacture in much larger quantities. Running with variable

loads, the cost of an indicated horse power produced by a steam-engine, and on the assumption that the work proceeded continuously day and night, would be not less than 0·8d. per hour, or £29 per annum; whereas if produced by Mond gas, and charging 2d. per 1000 cubic feet for the gas—the figure at which the Company proposed to supply it—the cost would not exceed £8 10s. per annum. If this were correct, there could be no doubt as to the advantage. Mond gas, at 2d. per 1000 cubic feet, if used in a gas-engine, was equivalent to a cost for fuel of £4 7s. 7d. per indicated horse power for one year, working day and night. With electricity at 1d. per unit—a very low rate—the equivalent figure would be £27 4s. The only question, so far as he knew, which was raised by the independent petitioners, was as to the breaking-up of streets. A certain number of local authorities were makers of gas, and urged that the Company should not be allowed to compete with them. But surely this would be very hard upon the manufacturers in the districts of these authorities. So long as the Company could only supply for power and heating in large works, no great harm could be done to these authorities, because they supplied little gas for power purposes; and he held that the giving of such supplies was not within the proper province of a local authority. Would the Committee allow local authorities who had gas-works, or gas companies supplying in the district, to block the way, merely because they might supply a small amount of coal gas for engine purposes? He was willing to give them protection from competition by the Company in the supply of gas for domestic matters, but not in the supply of fuel for heat and power. The Company proposed to have five separate stations, all of which would be near a railway and a good supply of water. Their total cost was estimated at £789,000, and that of working, distribution, &c., at £85,000. When in full swing on a supply of 84 million cubic feet of gas in twelve hours, at 2d. per 1000 cubic feet, the receipts would be £210,000; so that there would be about £125,000 with which to pay interest on the £789,000. Of course, this position could not be realized for some considerable time. Turning to the petitions, he said in several it was suggested that the gas was dangerous. This was most important; but it was an absolute mistake. What made gas dangerous or poisonous was the presence of carbonic oxide. It was true that a great number of gas companies were now using water gas, which contained a large amount of carbonic oxide. This question had become so serious that a Departmental Committee, with Lord Belper as Chairman, was appointed by the Home Office with reference to it; and they reported that no gas should be supplied publicly with more than 20 per cent. of carbonic oxide in it. Mond gas only contained 11 per cent. of carbonic oxide. The Home Office would be quite content if the promoters undertook that it did not contain more than 14 per cent. This they were quite willing to do; and the Bill would be amended to that effect. The gas had a very pungent smell, and so could easily be detected if it escaped. There were a great number of petitions; but they were very much alike. He would take first the Corporation of Smethwick, who opposed on the ground of competition and interference with streets. He recapitulated the powers inserted in the Bill with regard to these matters, which he said were more stringent against the Company and favourable to the local authorities than was usual. Then they said the production of Mond gas would be highly objectionable to the inhabitants, injurious to health, and would lead to serious depreciation of property. Coal-gas works, however, were liable to an action if they produced a nuisance; and no provision in the Bill gave these works any greater immunity. It was also suggested that, as the gas would be supplied at much greater pressure than coal gas, the leakage would be much heavier. The Company, however, were not going to produce gas to lose it in this way; and there would be practically no leakage. Then they said there was nothing to prevent a man taking gas for power purposes from using it for lighting. The Committee, however, would not desire the insertion of a clause giving the Company the right to interfere with what a man did with the gas when he got it. Apparently, the Corporation wanted to prevent a man doing what he wished in his own premises. They alleged that they were fully competent to supply all consumers within their district with gas, whether for lighting, heating, cooking, or motive purposes. This was a fair issue. He would prove that they were not, and that coal gas could not be supplied at anything like the same rate as Mond gas for heating and power purposes. Then they said the price to be paid Dr. Mond for his patents was excessive, having regard to the nature and lives of these patents. Dr. Mond had a large number of patents which had a considerable period to run; and for a licence to work them in this area, the Company were going to pay him in shares. He would get nothing until £250,000 had been paid up by the public. Then he would receive a certain number of shares; and when the whole capital had been subscribed, and the Company were in full working order, he would get £75,000 for his share out of £1,000,000 of capital. He was therefore entirely dependent on the success of the venture for any remuneration; and he had made things as easy as possible for the Company, because he had declined to take cash, and had accepted shares as payment.

Several Counsel at this stage announced that various Corporations—including Wolverhampton and Perry Bar—would not proceed with their opposition in this House, but must not be taken as being favourable to the Bill, because they reserved their right to appear when the measure was in the House of Lords, if it reached there.

Mr. WALLACE continued the opening statement after the luncheon interval. With regard to the petition of the Midland Electric Corporation for Power Distribution, who objected to the Bill on the ground of competition, they having authority to supply electrical power in a certain portion of the district, he pointed out that, while the Electric Corporation could supply for power they could not supply for heat, and the cost of electricity would not allow it to be used in any way for heating; so that for a great many purposes—such as brick-kilns, puddling, &c.—electricity would not come in at all. Therefore, they could only oppose so far as power was concerned. In conclusion, he referred briefly to the other petitions, in which few (if any) important fresh points were raised.

The following evidence was then called.

Sir *Frederick Bramwell*, examined by Mr. WALLACE, said he had been studying the subject-matter of this inquiry for many years past. So long as seventeen years ago, he had pointed out, in the report which he had made to the Birmingham Corporation, the immense waste of fuel in the engines which were then commonly employed in Birmingham. Steam-engines (especially small non-condensing steam-engines, such as were extensively used by small manufacturers) were extremely wasteful, because, although non-condensing, they did not use steam at anything like high pressure in the cylinder. With the best steam-engines, only 9 per cent. of the total theoretical value of the coal was obtained.

Mr. WALLACE: Comparing the gas-engine with the steam-engine, what do you find to be the relative efficiency?

Witness: You will get 29 per cent. out of the fuel, or over three times more than you get out of the steam-engine.

What do you say as to the products which are obtained?—In the ordinary fire of the steam-engine, nothing is obtained in the way of utility but the heat; all the other products are wasted. In the Mond gas, the ammonia is saved and turned into sulphate of ammonia. Thus the use of Mond gas does two things: It saves our store of coal by obtaining equal power with about one-third of the quantity, and adds to our power of producing crops by the saving of the valuable ammonia, which in all ordinary hand-fired furnaces is absolutely wasted.

In further examination, witness pointed out that, with the ordinary steam-engine, the boiler had to be heated-up in the morning, and the fire banked at meal times; but with the gas-engine there was no preliminary heating-up, and no banking of the fire. Other advantages of the gas-engine were that no smoke was caused, there was no carrying of coal or ashes, there was the saving of expense of boilers, chimneys, and so on, immunity from boiler explosions, and the saving of the labour of cleaning boilers. Gas-engines, too, were more economical in repair and maintenance. He also pointed out the advantages of regenerator furnaces, and the necessity of a proper supply of water in burning fuel. He should say that the Company would practically not affect the Corporations who owned gas concerns. According to his recollection, certain of the authorities and gas companies who were complaining talked of 300 million cubic feet of gas. From the five stations of the Mond Company, it was proposed to supply 600 million cubic feet of gas in the 24 hours, or double the yearly supply per day. It was idle to say that these two could come into competition. In regard to the opposition of the Electrical Power Company, so far as he knew, electricity was not in a position to deal with ordinary furnace work. The area of the district proposed to be supplied was 135 square miles; and there were 27 authorities in it, or one authority for every 5 square miles. That was to say, that each of these wretched little authorities, with an area of 5 square miles, was endeavouring to stop an important scheme which would deal with the whole 135 miles; and it was evident that these authorities would not combine together to themselves do the work. The supply of natural gas was becoming exhausted in America, where it had been used very largely; and he pointed out that there they were reverting to artificial gas. He believed the price proposed by the Company for the supply of gas would have the effect of attracting commerce as it had done in America. As to the leakage, this was due to disturbances arising from mining operations; and the Mond Company, it appeared to him, would have no effect in increasing the leakage already in existence. Of course, the Mond Company, for their own sake, would prevent leakage from their mains. In all districts subject to mining subsidences, they proposed to use steel mains of probably twice the length from joint to joint which prevailed in the case of ordinary mains—30 feet, instead of 12—and they intended to use a joint of the same character as that employed for compressed air in Paris, which would admit of very large subsidences without any perceptible leakage when under a pressure of about 15 lbs. per square inch. He believed the initial pressure of supply would be about 7 lbs. at the distributing stations, and at the point of delivery to the consumer about 2 lbs.; leaving a pressure of 5 lbs. through the mains. As to the objections in regard to the carbonic oxide in the gas, witness pointed out that the London Companies were allowed to introduce into their gas such a quantity of water gas as brought up the percentage practically to that which would exist in the Mond gas. The London gas was used for domestic purposes; and if an escape occurred, persons near at hand would breathe the carbonic oxide. But the Mond gas would not be used for domestic purposes, and therefore would not be breathed. After the carbonic oxide had been burned, no harm would arise from the fumes. The gas had a smell; but it was considerably fainter than that of coal gas. In regard to the loss of revenue which the existing gas companies feared would result to them from the competition of the Mond Company, he expressed the opinion that no such loss would arise.

Witness then, with the aid of cartoons, roughly described the process of manufacturing Mond gas, and showed a specimen of the coal used at the Winnington Works in the production of gas, which the Chairman remarked seemed to be a good quality of small coal.

Witness said he was informed that the price of this coal was 6s. a ton, and that the ammonia recovered from it yielded 4s. 6d.—leaving a net cost of only 1s. 6d. He saw no difficulty in distributing the gas; and large gas-engines were in course of construction, so that consumers might have an opportunity of running gas-engines of much higher power than hitherto. He had seen engines using Mond gas; and they worked well. He had seen one which was said to have worked from September to March without having been once stopped; and it therefore needed no repair. This engine, he thought, was 125 or 150 horse power.

Cross-examined by Mr. FREEMAN: He agreed that there did not exist in England at present an area so large as the one now proposed over which powers to supply gas had been given. Mond gas, so far, had only been tried in private works; and he could not say that it had been used in more than three. When they were supplying over the whole district, and had obtained all the customers they anticipated, they expected they would furnish 600 million cubic feet a day; this estimate being founded simply on the capacity of the Company to manufacture. He could give no estimate as to the probability of the gas being taken by any number of customers. Each of the five generating stations proposed would supply its own district; but there would be interconnection, so that one station might, if required, assist another. He did not fear competition. The Company expected to supply both large and small works. The power of the gas was about a quarter that of coal gas. It involved the use of very large pipes. It was proposed to have a main going in each direction from each station,

2 ft. 6 in. in diameter, with a carrying capacity of 120 million cubic feet a day. The pressure in these mains would be about 32 times that in ordinary gas-mains. So far as he knew at present, Mond gas could not be utilized for lighting purposes. If supplied for power, it could be enriched and used for lighting; but so could air. If these suggestions were acted upon, corporations supplying coal gas could be directly competed with; but he thought that most unlikely. The smell of the gas was weak and unpleasant; and it was not so likely to attract attention as ordinary coal gas. It was not more pernicious than the smell of the gas supplied by the London Companies, when they added water gas to the coal gas supply.

The proceedings were then adjourned till yesterday (Monday).

HOUSE OF COMMONS COMMITTEE.

Wednesday, April 24.

(*Before Mr.* F. W. Fison, *Chairman, Mr.* Yoxall, *Sir* A. Agnew, *and Mr.* Rigg.)

DEVONPORT CORPORATION (GAS) BILL.

This was a Bill to enable the Corporation to purchase the undertaking of the Devonport Gas and Coke Company.

Mr. Littler, K.C., Mr. Honoratus Lloyd, and Mr. F. Bodilly appeared for the Corporation; Mr. Balfour Browne, K.C., Mr. Claude Baggallay, K.C., and Mr. W. L. Williams represented the Gas Company.

Mr. Littler, in opening the case, said this Bill and the next were two which naturally must be taken together. One was a Bill of the Corporation to acquire the Gas Company, and the other was a Bill promoted by the Gas Company for extended powers. Devonport was lighted—so far as it could be said to be lighted at all—under the powers contained in an Act passed as long ago as 1853. He believed there was no other company in the country who had not been to Parliament for so long a period as 48 years. The Company was originally formed under an Act of 1845; but that Act was practically repealed by the one of 1853. This Act had one merit—it was extremely short; but it was short because it was absolutely defective in all the usual provisions for the protection of consumers. The Act provided that the limits of supply should be the whole of the municipal borough of Devonport. On this, a legal point might arise, with which he would not trouble the Committee, because the borough had been twice extended since 1853, and it was a question whether the rights and obligations of the Company would be held to extend with the borough. This circumstance, however, was one of those which induced the Corporation to think the present was a convenient time to conclude the whole matter by the purchase of the rights and interests of the Company upon equitable terms. The capital of the Company, as provided for in the Act, was £50,000, in 10,000 shares; and 4000 of these were fully-paid-up shares entitled to a dividend of 10 per cent., and vested in the shareholders of the old Company. The remainder were to be issued with a guaranteed dividend of 4 per cent.; but what had been done was that 3000 were issued as a 10 per cent. stock and 3000 as guaranteed 4 per cent., with the opportunity of rising to 6 per cent. Questions arose as to both classes of shares; and if the Corporation were right in their contention, the Company had illegally divided £25,000 among their shareholders. This point he would not ask the Committee to decide; but if they thought fit to pass his Bill, the arbitrator, in deciding the value of the undertaking, would undoubtedly take the matter into account. The next question was as to the provisions for the protection of the consumers. In section 55 of the Act, there was an obligation to supply gas within the limits to any public lamp where there was a main within 25 yards. Clause 56 provided that, with regard to private buildings, the Company were to supply gas if within 30 feet of the main; and clause 57 provided that the charge for gas might be, as a maximum, at the rate of 6s. per 1000 cubic feet. These were absolutely the only clauses for the protection of the consumers. Since 1853, the Company had been carrying on the undertaking. They had long ago exhausted their capital; but instead of going to Parliament as they should have done, they deliberately and advisedly spent very large sums out of revenue on capital account. For years they had been dividing their maximum of 10 per cent., not only upon the shares legally entitled to it, but also upon 3000 shares which were not entitled to it; and they had besides done everything that required to be done out of revenue, and had so avoided coming to Parliament and putting themselves under modern obligations. It was a doctrine of Pariament that every gas company ought, certainly not less frequently than once in fifteen years, to come to Parliament, so as to lay before the House their position, and put themselves under statutory obligations. There were many other irregularities, and many and serious complaints as to the quality of the gas. The gas had been most offensive in smell, and poor in illuminating power. The Company were under none of the restrictions of modern legislation as to purity, pressure, or illuminating power of the gas. Of course, the Company would promise to remedy all these things when they got their Bill; but he said the time had passed for remedy. The Corporation had felt very strongly on the matter; there being no proper method of relief by an appeal to the Courts, as there were no clauses in the Act imposing duties upon the Company. There was one cumbrous method under the Gas-Works Clauses Act of 1847, by which they had been able to get at the Company. This was by an application to Quarter Sessions for the appointment of an accountant to inquire into the Company's accounts, and say whether or not they were charging an unreasonable or excessive price for gas. It was an inconvenient remedy, and one which very seldom had any practical result. In their case, the Recorder said that, whatever strong feelings he might have had as to the moral propriety of the application before him, he did not see his way to give any legal relief. But the Corporation did derive a certain amount of advantage from their application, for an Accountant was appointed on either side; and the two made a report which was valuable as showing the position of the Company. The Accountants reported, in the matter of dividend, that "from the year 1846 to 1870 inclusive, the dividend paid ranged from 5 to 9½ per cent.; and from 1871 to 1900, the full maximum dividend of 10 per cent. was paid, without any deduction for income-tax." So that the shareholders not only had their full 10 per cent., but no deduction was made for income-tax, which was absolutely illegal. Then the report proceeded; "Assuming this capital to be entitled to a dividend of 10 per cent., after adjustment of income-tax, the dividends from 1854 to 1870 were underpaid to the extent of £3213 14s. 3d.; while from 1871 to 1890 dividends were overpaid, by reason of the non-deduction of income-tax, to the extent of £1084 7s. 6d.—leaving a sum of £2129 6s. 9d. as the net amount of authorized dividend short paid on the £15,000 additional capital, always provided it is entitled to 10 per cent. Assuming the limit of dividend on this capital is 6 per cent., dividends from 1854 to 1900 have been overpaid to the extent of £25,120 17s. 2d." Then the Accountants dealt with a number of questions which they thought should be treated as capital account. The report also strongly condemned the system of book-keeping. This was a joint report, and was signed by the Company's Accountant. The Corporation contended that, under the circumstances of the Company having kept out of Parliament so long, and having had so remarkable a condition of affairs, the whole matter should be strictly looked into. The question had been considered most carefully by the Corporation; and the feeling had become very strong that they should acquire the undertaking. There had been some difficulty in getting the statutory majority of the Council; but this had arisen from several members, all of whom were strongly in favour of purchase, being shareholders in the Company. A statutory meeting was held and the proposal was carried, not a single hand being held up against the resolution approving of the promotion of the Bill. The learned Counsel then proceeded to deal with the provisions of the Bill. The Corporation took powers to supply in the extended borough, and to transfer the Company's undertaking, not under the Act of 1899, but under the Lands Clauses Act, which gave an arbitrator the right, if he thought fit, to award 10 per cent. for compulsory sale. The Corporation were to give notice to purchase within six months of the passing of the Act. They also put in the following provision: "In assessing the sum to be paid by the Corporation to the Company, the arbitrator shall have regard to any moneys which have been distributed by the Company to the shareholders in excess of the moneys authorized by the Devonport Gas and Coke Act, 1853." Then they took power to purchase land for additional works; to construct and maintain gas-works; and for the regulation of the quality and pressure of the gas. They were to have the usual pressure and illuminating power in country places—15 candles; and they reduced the maximum price from 6s. to 4s. per 1000 cubic feet. At present, the charge of the Company was 3s. 1d., which in June would be reduced to 2s. 6d. The financial provisions were just those which the Local Government Board required in all cases from a corporation under the present circumstances. The learned Counsel read, and commented on, the only petition against the Bill—that of the Devonport Gas Company—and concluded by asking the Committee to permit the Corporation to purchase the undertaking at a full and fair, and, indeed, an ample, price.

Mr. Williams, for the Company, asked the Committee not to come to a decision on the Corporation Bill before the Company had presented their case on their own Bill.

Evidence was then given for the promoters.

Mr. *A. B. Pilling*, Town Clerk of Devonport, examined by Mr. Lloyd, said Devonport was a parliamentary and county borough, with a rapidly increasing population. The rateable value had almost doubled in the last twenty years. In 1880, it was £148,000; and in 1901, it had reached £260,000. The population, which in 1881 was 48,745, was estimated to be at the present time 75,000. Since he took office in 1897, the borough had been extended, and he had had many other matters to occupy his time. At last his attention had been directed to the Gas Company; and when the Company announced their intention to come to Parliament for further powers, it became absolutely essential that he should investigate their affairs. Last year a serious question arose between the Corporation and the Company, with reference to the public lighting. The street lighting had been carried out so unsatisfactorily that eventually the Town Council decided to take it out of the hands of the Company and undertake it themselves. The negotiations came to an end by reason of the Company's promotion of their Bill. Complaints with reference to the supply of gas generally were frequently made. He searched the records of the Town Clerk's office for copies of the accounts of the Company; but all they could find were two or three prints of the anuual report and accounts sent to the shareholders. On Oct. 9 last, he wrote to the Company asking for copies of the report and accounts for the previous six years; but all he received were those for the previous two years. The others, the Company stated, were out of print. These accounts were very meagre; and it was quite impossible from them to form an opinion as to the true position of the undertaking. The Gas-Works Clauses Act requires the Company to file a copy of their accounts with the Corporation; and the statement, if correctly made up in the form prescribed by the statute, was of great value in assisting a local authority to examine, in the public interest, the concerns of a gas company. He again, on Nov. 6, wrote to the Company; and their Solicitor replied that it was doubtful whether, under the Gas-Works Clauses Act of 1871, the Corporation were entitled to details of the Company's accounts. The Company, the letter proceeded, were desirous that the Corporation should be in possession of all the information to which they were entitled; "but the information will not be given with a view of receiving an offer from the Corporation to purchase the Company's undertaking." A long correspondence followed; and he was instructed by the Gas Committee to take proceedings against the Company for non-compliance with the Act. The fact was the Company had not performed their obligations either under the 1871 Act or the 1847 Act. When they examined the accounts, they came to the conclusion that on some of the shares the Company had been paying dividends at the rate of 10 per cent. when they were only authorized to pay 6 per cent. Under the Act of 1845, the original capital of the Company was £20,000; and by the Act of 1853, this was to bear interest at 10 per cent. The balance of the capital created under the 1853 Act was to be stock bearing not more than 6 per cent. interest. He found that one-half of these shares had

been issued and dealt with on the same lines as the original stock, and had received the same dividend of 10 per cent.—all the dividends being paid free of income-tax. On Jan. 4, witness and the Borough Surveyor (Mr. J. F. Burns) presented a petition to the Court of Quarter Sessions, under section 35 of the Gas-Works Clauses Act, 1847, praying for the appointment of an accountant to examine into and ascertain the actual state and condition of the concerns of the Company, and to report to the Court. The application duly came before the Recorder; and, though it was strongly opposed by the Company, he made the order, and appointed two Accountants. They presented their report at the next Quarter Sessions; and the Recorder found that he was unable to order a reduction of the price of gas. The report of the Accountants showed that, on last year's working, there was a deficiency of £1250, subject to the question whether certain charges should not have been placed to capital. They found that, assuming the £15,000 capital was entitled to 6 per cent. dividend, the Company had paid from 1861 to 1900 £15,832 which they had no business to divide at all. The effect of this was that the price of gas had been maintained at a higher level than it ought to have been; and though the Recorder could not order a reduction of price, immediately the proceedings were over the Company announced that they would reduce the charge 6d. per 1000 feet on June 1. Witness put in the judgment of the Recorder, and then proceeded to speak of the gas supply. Generally speaking, it was not satisfactory. It was very variable in quality; and the pressure was so insufficient that he could not use incandescent burners successfully. Many complaints were made as to the smell of the gas; and on Feb. 1 he wrote to the Company stating that complaints had been made to the Sanitary Committee of noxious smells, which were supposed to proceed from defective drains, but in almost every case the cause was found to be gas. The Company replied that on one day, and one day only, a noxious smell had been present; but this was in consequence of the oxide failing to do its work owing to the wet weather. They did not consider the reply satisfactory, especially as, about the same time, the Gas Examiner reported that he found sulphuretted hydrogen present in the gas in large and offensive quantities. Under the antiquated Act of the Company, the Corporation were not entitled to any test or testing-station; but they had made a testing-station at the Technical School, and had appointed Mr. S. W. Wright, an official of the Admiralty, as Gas Examiner. Witness then proceeded to speak of the defective lighting of the public lamps, the great difficulty they had had in getting the Company to extend their mains, and the long delays attending the laying of new mains. He had many serious objections to the Bill of the Gas Company. The Company proposed to convert on a 10 per cent. basis the capital which the Recorder held was only entitled to 6 per cent. dividend; so that they would legalize and perpetuate what they had illegally done for years. The suggested basis of conversion was, he considered, very unfair to the gas consumers, and was entirely in the interest of the shareholders. The Company proposed to do away with the maximum price, and to substitute a standard price with the sliding-scale; but, acccording to his figures, with gas at the normal price of 2s. 6d. per 1000 cubic feet, the Company could pay dividends equal to 13 per cent. on the present capital. The Company wanted to raise £133,000 of new share and loan capital; and the Corporation asked for £100,000 for new works. It was evident, therefore, that a considerable amount must be expended to bring the undertaking up-to-date. If the Company's Bill were to pass, there would be many matters upon which they would want protection for the public. He had considered the matter very carefully; and in his opinion it was in the interests of the Corporation and of the gas consumers that the transfer should take place.

Cross-examined by Mr. BAGGALLAY: In his view, the Company had expended very large sums of money out of revenue for capital purposes; and their earnings must therefore have been a great deal more than was necessary to pay the dividends which had been paid. In his opinion, the Company had paid their maximum dividend for a long time, and had paid certain dividends illegally. According to his view, the normal price of gas should be 2s. 6d. per 1000 cubic feet; and the profits of the Company had been in excess of the dividends they were authorized to pay.

Mr. BAGGALLAY: I will assume for a moment that the Company have applied revenue to capital purposes. I do not admit it, but I will assume it. I will assume, too, that it is wrong. Now, even if that is so—however wrong it is—it has not put money into the shareholders' pockets in the way of dividend, has it? It has been employed as capital not bearing dividend?

Witness: Yes; and the employment of that capital has taken money out of the pockets of the gas consumers.

How?—Because the Company have spent revenue on capital purposes where they ought to have utilized it in reducing the price of gas. Had the cost of gas been reduced, the gas consumer would have had the money in his pocket which the Company have got to-day.

Let us go to another point. Take, for instance, your allegation as to the maximum dividend. You are aware, that at the present moment, though the Company have been paying their maximum dividend for some time past, there is a claim unsatisfied in respect of back-dividends?—I do not admit it at all.

You may say that some money may have been paid off; but I ask you whether, as a matter of fact, there is not a claim?—Yes; the Company have, since the proceedings commenced, set up a claim to some £9000, I think, for back-dividends.

You know that, under the Gas-Works Clauses Act, unless they have paid the maximum dividends on such shares as are entitled to maximum dividends, they can make up any deficiency in years gone by?—Yes; but I know another clause in the Act, which provides that where a gas company have paid maximum dividends, and when they have paid the deficiencies of former years, they may then, and not till then, establish a reserve fund. This Company years ago elected to forego back-dividends, and in lieu thereof to establish a reserve fund. At all events, they have established a reserve fund without paying back-dividends.

But that amount of £5000 would not satisfy the claim by several thousands?—No. At the time the reserve fund was established, it is quite possible the Company thought it was much more in their interest to have such a fund.

Cross-examination continued: As to his complaint that the Company had illegally paid 10 per cent. instead of 6 per cent. on certain shares, though he alleged that the Company had done illegal acts, he did not wish for one moment to suggest that they had done them knowingly. He had always done the Company the justice to admit that they had acted rightly according to their lights at the time. He understood the issue took place within ten weeks of the passing of the Act; and whether they were strictly 6 per cent. or 10 per cent. shares was a question of law. In his opinion, if the undertaking were transferred the Company would secure the full and fair value of the concern under the Lands Clauses Act. He was speaking of the Company as a corporation; but he admitted that, according to his view of the issue of the stock, some individual members of the Company might sustain loss. But he did not wish to assume that the Corporation had any disposition to deal unfairly with the shareholders.

Mr. BAGGALLAY then questioned witness as to the payment of income-tax over and above the authorized dividend. He (the learned Counsel) believed that where a company were paying their maximum dividend, the income-tax should come out of the dividend. That was his own view; but there had been no legal decision on the question. If this were so, was it unreasonable to ask that the amount so paid for income-tax should be set off as against back-dividends?

Witness said he agreed this would not be unreasonable; but his view was that the arrears of dividend were only due on the original shares.

Thursday, April 25.

Mr. *Pilling* (recalled) was this morning further cross-examined by Mr. BAGGALLAY. Witness said he had not the slightest doubt that the Company needed new capital powers. The complaints about the gas supply had been both of insufficient pressure and bad illuminating power. There had been, before this year, no testing-station. As to the public lights going out, the Company had, he believed, attended to the matter, and tried to remedy the defects complained of.

Mr. BAGGALLAY: You would not suggest that the going out of a public lamp is a very unusual thing at a seaport?

Witness: It is not unusual at Devonport, I am sorry to say.

Proceeding, witness said the complaints as to the gas supply had been frequent, and had extended over a long series of years. He would admit that there must be complaints; and he allowed that occasionally the fault was in the fittings. But he could not admit that this was so in every case, because he found the same thing happen in the public lamps supplied direct from the Company's main which occurred in the private houses. As to the extension of the mains, they had no statutory power to compel the Company to lay down mains in certain portions of the borough; but the Company were under a contract with the Corporation to do so. There had been a breach of contract; but the Corporation had not confirmed the contract, as they wished to deal as liberally as possible with the Company. There had also been great delay in laying the mains. It took the Company a year to lay 440 yards; fifteen months ago they commenced to lay half-a-mile, which work was not yet completed. The great increase of population was mainly due to the extension of the Dockyard; the extension of the boundary of the borough had taken in a large area with a very sparse population. Prior to the Dockyard extension, there had not been a rapid increase of population. The great increase had been since 1891. He did not complain of the Company not supplying the added area; but the Corporation were under the obligation to furnish light; and he put it as another point in favour of them obtaining their Bill. He knew of no method of forcing the Company to supply; the Gas-Works Clauses Acts being so drawn as to make it impossible for a private consumer to take any action against them.

By the CHAIRMAN: Am I to understand that in the borough of Devonport there is absolutely no testing-station, either belonging to the Corporation or at the gas-works?

Witness: I do not know what they have at the gas-works; but we have during the present year established a testing-station of our own at the Technical School.

By the COMMITTEE: The Corporation had an Electric Lighting Order, and were building a generating station. At present there was no electric lighting; there was a station for tramway and traction purposes. The conclusion they had come to was that, with the exception of the main street and two or three others which they were bound by the Board of Trade to light with electric light, they could do ordinary street lighting better by incandescent gas than by arc lamps.

In further cross-examination, witness said the Corporation were the only body under a statutory obligation to supply the St. Budeaux area—it was an obligation, not to light, but to lay mains for supplying gas. There was no gas in the area, so they had put up oil-lamps in St. Budeaux, and also in the populous parts of Pennycross. The complaints were against the Company. He did not suggest that people of St. Budeaux were satisfied with oil lighting; it was an experiment.

Mr. *H. J. H. Graves*, Mayor of Devonport, said they had had reason to complain of the deficient pressure and the sulphurous smell. There was a general consensus of opinion that the gas supply should be in the hands of the Corporation.

Mr. *S. W. Wright*, an official of the Admiralty, said he attended at the Technical School and tested the gas. He had a photometer, and performed a lead-paper test for sulphuretted hydrogen; but he had no tests for bisulphide of carbon or ammonia. He had tested for pressure in Houghton Place; and there he found ten-tenths of an inch at the lamp-posts, and about nine-tenths at the entrance of the house. This was insufficient. He had taken tests as an Admiralty official, but was not allowed to give details. As a private consumer, he had found a deficiency of pressure. He found sulphuretted hydrogen in the gas on Feb. 25 of this year; but that was the only occasion.

Replying to Mr. YOXALL, witness said the illuminating power was very variable. Occasionally they got 16 candles, but generally less.

Mr. *F. H. Gill*, Solicitor, of Devonport, said he was in 1899 and 1900 Chairman of the Devonport Mercantile Corporation—an association of 300 members, including most of the heaviest gas consumers of the borough. He spoke of the complaints as to the unsatisfactory state of the gas supply, both as regarded the illuminating power and the purity. He was a holder of 27 original shares in the Company, and was under contract to purchase five or six others. Out of his 27 shares, 17 were

shares which the Corporation said should bear 6 per cent. dividend. The feeling of the people of Devonport was strongly in favour of the Corporation Bill.

Mr. *W. J. Lamb*, Mr. *H. F. Whitfield*, and Mr. *A. H. Whidden* having given evidence as to the defective gas supply,

Mr. BODILLY said if the Committee could give them a short adjournment, the proceedings might be considerably shortened.

Mr. BALFOUR BROWNE agreed that possibly some of the labours of the Committee would be saved if they had an opportunity of conferring on some matters.

The Committee then adjourned for an hour. On resuming the proceedings,

Mr. BODILLY said they had been near coming to an arrangement; but unfortunately it had fallen through, and the evidence would have to go on.

Mr. *E. W. Drew*, a member of the firm of Lass, Wood, and Drew, examined by Mr. BODILLY, said he investigated the accounts filed by the Devonport Gas Company with the Town Clerk, in accordance with the Gas-Works Clauses Act, 1871. He had summarized these accounts in tables, which he produced. He found the whole authorized share and loan capital of the Company, amounting to £65,000, was raised prior to May 31, 1890. The capital expenditure at that time was £64,052; and the expenditure charged by the Company to capital account during the ten years to May 31, 1900, was £7751. The Company had also expended on prepayment meters and fittings the sum of £1820, which was not charged to capital account, but was put in the balance-sheet as an asset or stock. The accumulated surpluses of the Company, after providing for interest on mortgages and loans and payment of dividends for the eight years 1892 to 1899, were £16,422 11s.; and in 1900 there was a deficiency of £1630 1s.

Mr. BALFOUR BROWNE: Did you leave out the £1496?

Witness: Well, I did not take that into account.

That is not quite fair?—Because there was a sum of £4000 standing on the profit and loss account, against which the sum of £1496 could be charged, and would leave £3000 in addition.

Mr. BALFOUR BROWNE: Still, on your own tables, if you take in the surpluses you ought to take in the deficiencies.

Witness said he found the surplus had been used by the Company in paying for capital expenditure and providing working capital during these ten years. If the Company had been paying £600 per annum in excess of their powers, the surplus would have been increased by this amount. The Company had left out the stock of residuals during the ten years, except in May, 1891, when they brought into account a stock of tar to the value of £640. He also found that income-tax had been charged to the revenue account, under the head of rates and taxes, which should have been shown separately on the profit and loss account. On Jan. 11 of the present year, he was appointed, with Mr. Plumb, by the Recorder of Devonport, to examine and ascertain the state and condition of the works of the Company, under section 35 of the Gas-Works Clauses Act. He found that in the year ending May 31, 1900, £723 14s. 11d., the cost of extensions of mains, services, and meters, had been charged to revenue account which were properly chargeable to capital. In the same way, the revenue account had been charged with the cost of two new boilers, the repairing and renewal of retorts, alteration to the retort-house and coal-store, and the erection of new chimneys. These sums he could not apportion, as the records of the Company were very incomplete. He found the books of the Company were badly kept, and not in accordance with the form prescribed in the Gas-Works Clauses Act of 1871. The system was a very faulty one. The Company did not allocate their expenditure under the headings prescribed in the Act; they did not dissect their wages properly; and they charged things to revenue which should have been charged to capital. Besides, they did not bring into account the stock of residuals; and there was a mistake of several hundreds of pounds in the amount put down as the stock of coal on May 30, 1900. The Company had erected the works originally on land held on lease; and in 1897 they purchased the freehold for £8250. Of this sum, the Company charged £4000 to capital, £1500 came from the revenue fund built up from the profits of 1894, and the balance was charged against the net revenue of the Company in 1897. The £4000 charged to capital came from a depreciation account; so that the whole of the land they owned was bought out of revenue.

Mr. BALFOUR BROWNE: We had actually power to form that depreciation fund for property on leasehold land.

Witness (continuing) said he had, with Mr. Plumb, prepared tables showing the dividends authorized and paid. Assuming this £15,000 additional capital was entitled to 10 per cent. dividend, the dividends short paid from the formation of the Company to May 31, 1900, would be £11,308 2s. 8d. But if the £15,000 was only entitled to 6 per cent., the Company had overpaid dividends to the amount of £15,852 1s. 3d. The reserve fund had been full for some years past; and the Company had since 1872 paid their maximum dividend, free of income-tax.

Cross-examined by Mr. BALFOUR BROWNE: He could not say what harm had been done to the consumers. The object of Parliament, he believed, was to get gas manufactured and supplied as cheaply as possible. No capital had been raised by the Company for ten years; and if more capital had been raised, more money must have come out of the pockets of the gas consumers.

Witness was still under cross-examination when

Mr. BALFOUR BROWNE said an arrangement had been come to by which the Company agreed to sell their undertaking to the Corporation upon terms as to which there was some difference of opinion. The clauses had been drafted; but they were still in the rough, and he asked the Committee to adjourn the consideration of the Bill till the following afternoon.

The Committee then accordingly adjourned.

Friday, April 26.

Mr. LITTLER this afternoon announced that the clause was not quite agreed; and he asked the Committe to take the clause on Monday morning.

Mr. BALFOUR BROWNE supported the application; and the Committee agreed to this course.

Monday, April 29.

Mr. BALFOUR BROWNE announced that, owing in a great measure to the further adjournment the Committee had allowed them, they had been able to arrange matters to the satisfaction of both parties. The Corporation were anxious to purchase the undertaking; but the Company being a local one, they did not want to drive a hard bargain. Every word was now arranged; so that the Committee would only have to go through the clauses with the Agents.

The CHAIRMAN said he would like to know what they proposed with regard to clause 35, which dealt with the period within which the loan should be repaid.

Mr. LLOYD said they had agreed with the Lord Chairman (Lord Morley) to reduce the period for the repayment of the money borrowed to forty years. This was the ordinary time.

The CHAIRMAN said the Committee would pass the preamble of the Bill; and the clauses were then gone through and adjusted. The purchase clause provides that the Corporation shall purchase, under the Lands Clauses Acts, the undertaking of the Company, and that the Company shall retain their reserve fund of £5000, with which they shall pay the costs of the proceedings at the Quarter Sessions and their costs and expenses of the present parliamentary inquiry. The shares which the Corporation contend should bear only 6 per cent. interest, and which have been treated as 10 per cent. stock, shall be considered as 10 per cent. stock. The Company shall forego all claims for back-dividends, amounting to £9000 odd. The Managing-Director shall have a retiring allowance of £150 a year. As from April 25, the Company shall not incur any liability on capital account, or any special expenditure on revenue account, without the consent in writing of the Town Clerk.

Mr. BAGGALLAY said, the Corporation Bill having been concluded, the Company withdrew their Bill.

The Bill of the Corporation was accordingly ordered to be reported to the House, as amended, for third reading.

WELLS (SOMERSET) WATER BILLS.

The Corporation of Wells and the Wells Water Company introduced two Bills to Parliament this session—to an extent competing schemes—and they were referred to a Select Committee, presided over by Mr. ARTHUR ELLIOTT, who sat last week, and eventually passed the former Bill subject to an agreed purchase clause.

Mr. ERNEST MOON, in opening the case for the Corporation, whose Bill was taken first, said it was promoted with three objects. The main object was the purchase of the existing Water Company on arbitration terms, under the Lands Clauses Act; the second object was to provide further works, consisting chiefly of a storage reservoir, capable of containing 6 million gallons, for the purpose of supplementing the existing sources of supply, which were not sufficient to meet the present demands; and the third object was to include in the area of supply the district of Wookey, in which there was a considerable number of people who were in need of additional water supply. St. Cuthbert Out, though outside the town of Wells, and outside the jurisdiction of the Corporation, was within the area of the existing Company; and the Corporation had the cordial support of the Local Authorities of Wookey and St. Cuthbert Out in their endeavour to obtain jurisdiction in the matter of water supply over these new districts. The capital cost of the existing water-works was £8200, on which as regards the £5000 of ordinary capital the Company had paid maximum dividends of 10 per cent. for the past three years—4 per cent. being payable on the debentures. There was nothing to be said against the purity of the existing supply; but there was a good deal to be said against its sufficiency since 1887. In that year the Corporation, feeling a little uneasy about the matter, proposed to buy out the Water Company; and a provisional agreement was come to in 1889 under which the Company agreed to allow themselves to be sold for the sum of £15,000. The Corporation thereon applied to the Local Government Board to hold an inquiry in the usual way, with a view to allowing the money to be raised for the purpose. The inquiry was held; but the Local Government Board reported that it would not be for the financial advantage of Wells that the Corporation should buy out the Company. As it turned out, that was a mistake on the part of the Local Government Board; for experience had since shown that it would have been a great advantage. For some time past, the Corporation had experienced considerable difficulty in obtaining a sufficient supply of water for their cattle market and other purposes; and the Medical Officer of Health reported that the constant cutting-off of the water by the Company created an unsanitary state of things. Negotiations for the purchase of the water-works having failed, the Corporation determined under the Borough Funds Act to promote the present Bill, in which course they were supported by a majority of 650 to 343 votes in a poll of the ratepayers, who unanimously sanctioned the opposing by the Corporation of the Bill of the Company. If the construction of the storage reservoir proposed by the Corporation were sanctioned, it would not be necessary to go to fresh sources of supply, as it would be possible to store in the winter and spring months for use in the dry part of the year the water which now ran to waste. The actual amount proposed to be spent by the Corporation under the Bill was £10,000; and the fact that the Water Company were (in a kind of death-bed repentance) asking for power to construct further works, though they only proposed to add 3000 gallons a day to the water supply of Wells—a mere fleabite—showed that, even in the opinion of the Company, additional works, for which further capital would be required, were necessary. As regarded the financial position of the Corporation, the rateable value of Wells was £19,345; the rates amounted to 4s. 3d. in the pound; and a penny rate provided £82. The assent of the Local Government Board had been obtained to the promotion of the Bill; and he asked the Committee to allow the Corporation to carry out the necessary works, and buy the undertaking on fair terms such as would inflict no hardship on the Company.

Mr. HUTCHINSON (for the Water Company), in reply to an inquiry by the Chairman, said the Company would rest their case mainly on two

grounds. In the first place, they contended that the works proposed by the Corporation were not required, and that it was not at all necessary to spend such a large sum of money in the interest of Wells. In the second place, they contended that the best people to carry out the necessary works and manage the water supply of the town were the Company themselves, and that the sanctioning of the scheme of the Corporation would impose an undue burden on the ratepayers of Wells which they had never been led to contemplate.

Mr. Crosse, the Mayor of Wells, Mr. R. Bowring, the Chairman of the St. Cuthbert Parish Council, Mr. Lunnon, the Chairman of the Wookey Parish Council, and Mr. Foster, the Town Clerk of Wells, all gave evidence (in support of the opening statement of Counsel) to the effect that there had been many complaints as to the inefficiency of the present water supply and of the want of a constant supply. The general feeling of the inhabitants of the town was that it was desirable that the Corporation should obtain control of the water supply. The reason why they attached so much importance to the water supply being in the hands of the Corporation was that they believed it would be the best means of obtaining a constant supply, for which the townspeople would even be willing to pay a little more. In cross-examination, it was admitted that the scarcity of water which had been complained of was in part due to the waste caused by the breakage of the Company's main by the Corporation's steam-roller. The Mayor (asked about the terms of purchase) said he thought £15,000 was a fair price for the undertaking; but even if it was decided to be as much as £20,000, he did not believe it would impose any undue burden on the ratepayers.

The CHAIRMAN, just before the adjournment on Tuesday, said it was the practice of Committees to hold that local authorities were the best persons to be entrusted with the water supply of their districts, unless there were any special circumstances which made it desirable to depart from the usual practice. The Committee felt very strongly that this was the real point which they had to decide, and that they had nothing to do with the question of the amount to be paid for the water-works, which would, of course, be left to the arbitrator should they pass the Corporation Bill.

On the Committee assembling on Wednesday,

Mr. FREEMAN, K.C. (who appeared with Mr. Moon for the Corporation), announced that he had been able to make concessions to the other side, which he hoped would dispose of some of the difficulties in dispute. The Committee, no doubt, were aware, he said, that when property was compulsorily acquired, the practice was to make some additional allowance—10 per cent. generally, though in the case of water-works the allowance was considerably less. Now, in respect of this compulsory sale, he was prepared to concede to the other side that it should be a direction to the Umpire to allow the full 10 per cent.; and in addition to that he was prepared to undertake that all the officers of the Company who were not taken over by the Corporation should be duly compensated.

Mr. HUTCHINSON said he regretted that he had to bow to the inevitable, and accept the terms his learned friend had offered.

An adjournment was then made for the preparation of a clause to give effect to the foregoing undertaking; and as finally approved by the Committee it ran as follows: "And in the event of such arbitration taking place, the arbitrators or umpire shall, in settling the amount to be paid by the Corporation to the Company, allow the sum of 10 per cent. as compensation for compulsory purchase; and no officer who shall have been in the employment of the Company for twelve years or upwards shall lose his right to compensation by reason of his declining to continue in the service of the Corporation."

The other clauses were then agreed to; and the Bill was ordered to be reported to the House.

Water Supply of Tunbridge Wells.—A week's test, recently carried out, has shown that the new artesian wells at Pembury are capable of yielding 700,000 gallons of water daily. By the success of this scheme, it is estimated that £70,000 has been saved to the town.

Horley District Gas Bill.—This Bill came before the Select Committee of the House of Commons last Monday, presided over by Mr. Harwood. It will be remembered that, in consequence of an agreement come to between parties, by which the Horley District Gas Company undertook, on terms, to acquire the undertaking of the Crawley Gas Company, the Committee were instructed by the House to consolidate with the Horley Bill such parts of the Bill promoted by the Crawley Gas Company as were necessary to give effect to the agreement. The amended Horley Bill was submitted to the consideration of the Committee; and the clauses having been formally gone through, the Bill was ordered to be reported to the House.

Water-Pipe Destruction in New York.—The "Street Railway Journal" recently contained the following remarks on this subject: "The large amount of water supplied to the water-mains in New York City has led the authorities to believe that there were serious leaks in the service-mains. That this is true is shown by an accidental discovery during March in Lower New York, where it was found that in one place some 20,000 gallons daily were escaping through a defective pipe; and subsequent examination has shown a great deterioration in the water-pipes in this section of the city, and countless leaks. Indeed, it is thought that more than half of the water supply of the city escapes through defective pipes. The preceding remarks read very much like the introduction of a paper presented before an association of the water companies, as the preliminary to an attempt to charge up the destruction of the pipes to electrolysis caused by the rail return circuit of the local trolley company. This plan would undoubtedly have been promptly followed in New York City by the electrolytic enthusiasts, except that, unfortunately, all the lines on Manhattan Island use a complete metallic return, and also that the most serious leak is very far distant from an electric railway line of any kind. It is a curious fact that deterioration of water-pipes from natural causes seems to cease immediately on the introduction of a trolley system, and the return circuit just as promptly commences its fell work. We hope that the New York example will show that water-pipes do occasionally give out from causes other than those of the return circuit."

MISCELLANEOUS NEWS.

NEW GAS-WORKS FOR THE PERTH CORPORATION.

Closing of the Old and Opening of the New Works.

Last Friday, two interesting ceremonies took place in Perth, in the formal closing of the old gas-works in Scott Street, and the inauguration of the new ones, which have been erected at Friarton, about a mile to the south of the city. A company of about 140 gentlemen assembled at the Council Chambers, whence they drove to the old works, and grouped themselves round the door of the exhauster-house.

Lord Provost MACGREGOR said they did not care about parting with their good old friend—that old and useful institution—which had served its day and generation, and had served it well. They would observe that it was an antiquated and time-worn—he might almost say war-worn—structure. It had fulfilled its function in the last fifty or sixty years; and now, since they had a great establishment to take its place, they parted from it—but it was with regret. As they had a good deal to do, he would say no more, but would ask Mr. Whimster to bring the works to a perpetual close.

Mr. T. Whimster (the former Gas Engineer to the Corporation) entered the house and stopped the working of the exhauster. When he reappeared,

Lord Provost MACGREGOR said he had now to perform a very pleasing duty. Their venerable and much-respected friend, Mr. Whimster, was with them that day, and they hailed him as one of the citizens whom they were proud to name in the community. Mr. Whimster had, he believed, been associated with the gas-works from his earliest days; and he had proved himself to be one of the best officials the Corporation had ever had. The fact of his having been forty-five years a servant of the community, and having never had fault found with his work, spoke volumes for the good offices he had rendered to them. Perth desired to honour Mr. Whimster that day. He left the place with the best wishes and the heartiest congratulations of the whole community. They desired to mark their appreciation of his great work for nearly half-a-century; and he (the speaker) asked him, in the name of the people of Perth, to accept a silver salver. Upon it the artist would later on depict his portrait and a view of the works; and he trusted Mr. Whimster might look upon it for many years with satisfaction. Mr. Whimster had an amiable helpmeet, and she was not to be forgotten. She also would receive, as a token of their esteem for her, the gold bracelet which he asked Mr. Whimster to accept on her behalf.

A photograph of the assembled company was taken at the moment of the presentation.

Mr. WHIMSTER, speaking with much emotion, said he begged to thank them for the honour they had done him, in asking him to take a prominent part in this function. It was 76 years since the place was begun. He knew it first in 1834, when he was five years old. At that time the Gas Company were carting cannel all the way from Fifeshire, by Kinross. Two carts came there twice a week, bringing first-class cannel from Capeldrae. The rest of the coal required for gas making was brought by sea from Bo'ness. No common coal was used in those days, and the quality of the gas made was 38 candles. In 1851 he was appointed Manager of the Company's works, in which there were twelve retorts in use in mid-winter, making about 12 million cubic feet of gas a year. Now there were 122 retorts, making 173 million cubic feet of gas per annum. He considered it was a happy thought to close the place with a function like the one on which they were engaged. It gave one an opportunity of looking back over the progress made. The price of gas when he became Manager was 7s. 6d. per 1000 cubic feet; two years ago it was 3s. 2d.; and it would have been less to-day had it not been for the extraordinary rise in the price of coal. He begged to thank them for the very valuable and appropriate presents which had been made to him and to his wife. He regarded them as tangible and enduring testimonials to his humble endeavours, and, he hoped, successful work, in the place for 46 years, including 24 years under the Commissioners. During all these years he was constantly and very usefully engaged. He did not have leisure to weary in his duties; but he nevertheless found time to contribute to the interests and the aims of his profession outside of Perth. He was for many years an active member of the North British Association of Gas Managers, and they honoured him by making him President three times. The object of the Association was generally to advance the interests of the gas industry; and their meetings had proved of great benefit both to the gas profession and also to gas companies and municipalities. It was gratifying to him to think that he had been looked upon with confidence, and that he was still in their good opinion. He felt that everything had been well carried forward in Perth, and that they were entitled to claim to have kept very well to the front in all matters connected with gas manufacture.

The drive was then resumed. On arriving at the gate of the new works,

Sir ROBERT PULLAR said he had had an important duty committed to him. He felt very highly honoured in being asked to take part in this very interesting ceremony. He was glad to see that the excellent Manager who had shut off the old works was still hale and hearty; and he hoped the work which Mr. Whimster had done would be imitated by those who would come after him, for it was no rule-of-thumb work with him. It had cost the Town Council a great deal of labour to get the new gas-works erected. He had not yet seen them; but he knew they would be admirable, and he had no doubt they would be very useful. He had no fear whatever that there would not be ample use for them. Before they could get admission to the works, it was necessary they should find a key wherewith to open the gate. This he had in his hand; and he had been requested to present it to Lord Provost MacGregor. He hoped that the gate would be open not only by day but also by night, that many would go in and out thereat, that they would find a sphere of usefulness within it, and that the works would be for the good of the city.

Taking the key, the Lord Provost unlocked a small gold padlock and unwound a gold chain by which the gate was fastened. Throwing back the gate, he declared the works open. The chain and padlock, it may be mentioned, are gifts to Mrs. MacGregor.

The Lord Provost said he was very glad to see so large a body of his fellow-citizens present to assist at the opening of the new gas-works; and he was proud to be Lord Provost when these great works were finished and brought into operation. There was room for expansion; and in the days to come, when those present were forgotten, the townspeople would bless them for the great spirit they had shown in inaugurating and completing this grand establishment. He could not speak too highly of the work of the Gas Committee, and particularly of that of Mr. Watson, the Convener, who had given much thought, study, and time to it. He thanked Sir Robert Pullar for his remarks in presenting the key to him. He could assure them he would retain the key, and wear it as a memorial of this great and auspicious day.

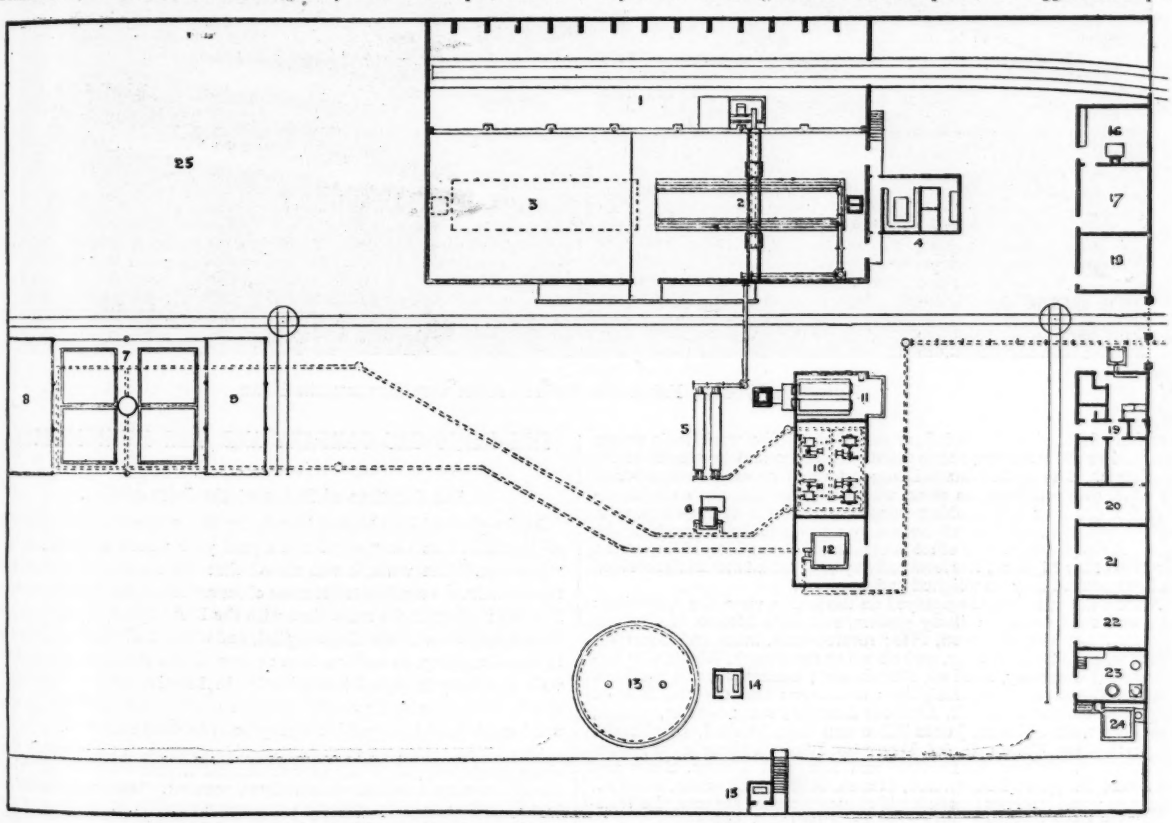
The company entered the works, and, dividing themselves into three parties, were conducted over them by Messrs. Andrew Gillespie, of Glasgow, Mr. John Gillespie, his son, and Mr. W. B. M'Lusky, the Engineer and Manager.

The works were found to be most complete and up-to-date, and also in perfect order. After spending an hour in them, the company were conveyed in a special train to the Central Railway Station, where dinner was served in the hotel, the Lord Provost being in the chair. The toast of "The Perth Gas-Works" was proposed by Mr. D. Macfie, of Edinburgh, and was acknowledged by Mr. W. Watson, the Convener of the Gas Committee. Bailie Brand proposed "The Engineers and Contractors," which was acknowledged by Mr. A. Gillespie, and on behalf of Mr. John West, of Manchester, who was unable to be present, by his son. Mr. Gillespie, representing the Contractors, presented Mr. Watson with a gold watch and a silver salver, and with a gold brooch for Mrs. Watson.

Each of the guests at dinner was presented with a *souvenir* of the opening of the works in the shape of a book, containing a history of the gas undertakings in Perth from the beginning, and giving a description of the new works. The letterpress is interleaved with photographs of former and present officials, and of the new works. We extract the following particulars:—

The new works at Friarton occupy an area of about 4¼ acres, and are situated on sloping ground lying between the River Tay and the Edinburgh Road. The site is well adapted for gas-works, as it is quite away from the city and from the direction of its present extension, and yet near enough for convenience in working. The gasholders which supply the lighting district are midway between the new works and the city. The initial capacity of the works is equal to a make of a million cubic feet of gas per 24 hours; and the works are capable of being extended within the boundary walls to at least three times this quantity, while the arrangement is such that the additions can be carried out without any change of existing plant.

Entering the gates, the buildings immediately on the right [see plan] are general stores and workshops; on the left are the offices, laboratory, coal-testing room, and sulphate of ammonia plant; in front, to the right, in one large building with two spans of roof, are the retort-house and coal-store. The coal is taken into the store by a high-level railway carried on steel girders and concrete piers; the waggons are emptied



Block Plan of Friarton Gas-Works, Perth.

1. Coal-Store.
2. Retort-Bench.
3. Extension of Retorts.
4. Workmen's Rooms.
5. Condenser.
6. Scrubber-Washer.
7. Purifiers.
8. Lime-Shed.
9. Oxide-Shed.
10. Exhausters.
11. Boilers.
12. Station-Meter.
13. Tar and Liquor Tank.
14. Tar and Liquor Pumps.
15. River-Water Pump.
16. Smith's Shop.
17. Mechanic's Shop.
18. Store.
19. Offices.
20. Laboratory.
21. Coal-Testing Room.
22. Sulphate Store.
23. Sulphate Plant.
24. Sulphuretted Hydrogen Purifier.
25. Coke-Yard.

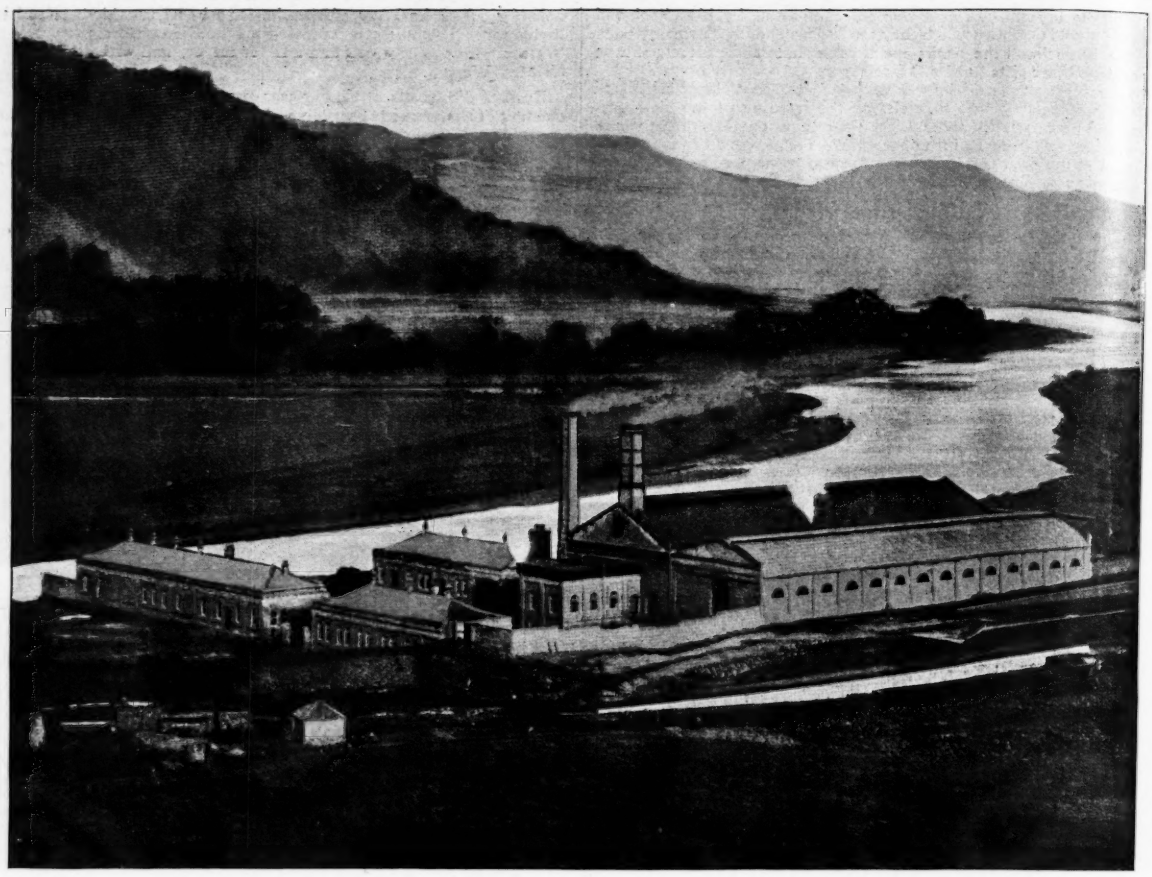
into a coal-breaking machine driven by a steam-engine; and, after the coal is broken to a uniform size, it is carried by elevator buckets to the overhead hoppers placed on either side of the retort-house. When the coal is not being sent direct to the hoppers, it is tipped from the railway waggons into the store, which is capable of containing 3300 tons, or equal to five weeks' supply in winter. The retort-bench and coal appliances have been constructed by West's Gas Improvement Company, Limited, of Manchester. The bench consists of seven double ovens, placed back to back, each containing eight retorts 22 in. by 16 in. D section, or 112 in all. The ovens are constructed on West's regenerator system. The charging and drawing operations are performed by West's patent manual machines.

The exhausters, combined with their steam-engines, are in duplicate, and are each capable of passing 80,000 cubic feet of gas per hour. They are placed in a room forming one of a block of buildings containing also the steam-boilers and station-meter. This room is of ample size, and space has been reserved for placing therein the two smaller exhausters at present in use at the Scott Street works. These will run during the summer months, and will save the wear and tear of the larger plant. Steam for driving the exhauster, engines, pumps, and other apparatus, is generated in two steam-boilers of the Babcock and Wilcox type. They are fired with coke from the retorts; and their feed water is heated before entering the boilers by a special heater, in which the exhaust steam from the engines is used as the agent. After leaving the exhauster-house, the gas passes through the scrubber-washer placed at the end of the condensers. It is of the new vertical mechanical type made by Messrs. W. C. Holmes and Co., of Huddersfield, and is capable of removing the ammonia from 1½ million cubic feet of gas per day. There are four purifiers, each 25 feet square—two lime, and two oxide of iron.

The station-meter is capable of passing and registering 80,000 cubic feet of gas per hour. On leaving the meter, the gas is conveyed by a new 20-inch main along the new road to the two gasholders at the South Inch gas station; and after passing through the district governors there, the gas from Friarton serves the consumers through the old system of pipes.

The tar and ammoniacal liquor flow together into a large circular stock tank (formerly a gasholder tank at the Scott Street works), from which the liquor is pumped to the sulphate-house, and the tar into railway tank-waggons for despatch to the distillers. The liquor is dealt with at Friarton. The sulphate of ammonia department is placed at the northern end of the front block of buildings. It consists of a still and saturator-house, store, and (outside) a condenser and purifier for the removal of the sulphuretted hydrogen fumes from the waste gases.

The offices consist of a handsome suite of rooms, the general office, Manager's room, assistant's room, drawing office, and laboratory, in which there is a pentane photometer, supplied by Messrs. James Milne and Son, Limited, of Edinburgh. The meter and exhauster houses are



New Gas-Works, Friarton, Perth, from the Edinburgh Road.

tastefully finished with tiled floor and dado. The workmen's rooms attached to the retort-house are fitted with baths and lavatories of the best class. The roof of this building is formed by an iron water-tank for water pumped from the river, which supplies the whole works, except for drinking and washing purposes. A large fitting-shop, with smithy attached, enables all necessary repairs to be effected on the spot. A weigh-bridge and office is erected on the railway siding at the junction of the high and low level railways, so that all materials received and despatched may be weighed and recorded.

Among the contractors employed on the works were the following: Iron and steel roofing, railway girders, and tank, Messrs. H. Balfour and Co., Limited, of Leven, Fife; retort-bench, brick and ironwork, elevator, coal-breaker, floor, and charging machinery, West's Gas Improvement Company, Limited, Manchester; condensers and purifiers, Messrs. Clapham Bros., Keighley; exhausters and engines, Messrs. Bryan Donkin and Clench, Limited, London; station-meter, gauges, gas-fittings, &c., Messrs. James Milne and Son, Limited, Edinburgh; sulphate plant, Messrs. R. & J. Dempster, Limited, Manchester; pipes and fittings, Messrs. R. Laidlaw and Son, and Messrs. Shaw and M'Innes, Glasgow; lamp-pillars, Messrs. M'Dowell, Steven, and Co., Glasgow; and lanterns and intensified incandescent burners, the Welsbach Incandescent Gas-Light Company, Limited, London.

A New Reservoir for St. Helens.—Last Tuesday, the St. Helens Water Committee had under consideration the special report of the Water Engineer, in which he urged the necessity of providing additional storage accommodation; the cost of the reservoir and connections being £22,700, and the land £1940—a total of £24,640. The Committee decided to recommend the construction of the reservoir.

An Ironmonger on Municipal Trading.—The subject of municipal trading was dealt with by the newly-elected President of the Ironmongers' Federated Association, the annual conference in connection with which was held in Birmingham last week. He said it was very necessary to draw a well-defined boundary, inside which municipal enterprise should be allowed. The present direction of municipal trading, in the hire of gas-stoves, gas, water, and electric light fittings, free wiring, &c., affected ironmongers and kindred trades. He did not think it was for the benefit of the masses for corporations to go outside what he should call their legitimate sphere of work. The masses did not want gas-cookers, gas-fittings, and free wiring. It was the well-to-do who got them at the expense of the masses; for if they did not pay, the masses must bear their share of the loss. The well-to-do, who had the guidance of municipal affairs, would see that too much profit was not made out of them for the relief of the rates. There was plenty of scope for municipal enterprise. The proper sphere of the municipalities was to control what was really public work—anything that occupied their streets, on, above, or underground, such as gas and water supply, trams, and the telephone service, and the housing of the working classes, if it could not be done well by private enterprise. Mere profit should not be the object of municipal work, but the betterment and uplifting of the people.

THE PARIS GAS COMPANY AND THE MUNICIPALITY.

The Question of Reducing the Price of Gas.

At the close of the abstract translation of the report of the Directors of the Paris Gas Company for the past year which appeared in the "Journal" last week, it was stated that the concluding portions of that document were devoted to some observations on the litigation which had been going on for some time with the Municipality in reference to the amortization of the share capital, and which had resulted adversely to the Company, as well as to a review of the abortive negotiations with that body in regard to a reduction in the price of gas. The former matter does not call for notice; but there are certain features in connection with the latter which it may be of interest to record.

The Directors informed the shareholders, through their report, that since the meeting early last year the negotiations above referred to had been once more opened and actively prosecuted. The proposed reduction in price was to be subject to two prime conditions. First, as to the ownership of the assets and their division at the end of the concession in 1905, the agreement to be come to was not to injuriously affect the rights of either of the parties thereto, as set forth in the Treaty of Feb. 7, 1870. In the second place, the reduced income resulting from the alteration of price was to be made good by a financial arrangement which, while giving satisfaction to the consumers, would keep intact the budget resources of the Municipality, and leave to the Company the legitimate profits arising from their undertaking. The first condition, however, gave rise to a rather difficult point, which had caused trouble as far back as 1892, when negotiations were set on foot for effecting a reduction in price. In the course of the discussions on the question which then took place, the Prefect of the Seine decreed that a condition precedent to the conclusion of any agreement must be the recognition by the Company of the right of the City to take possession of the distributing plant and works on Jan. 1, 1906, subject to the payment of such sum as might be agreed upon, or be determined by valuation, for the moiety of the works specified in article 6 of the Treaty of 1870. After consultation with the Company's legal advisers, the Directors expressed, in a letter dated Dec. 5, 1892, their willingness to continue the negotiations, but they declined to entertain the idea of relinquishing without compensation the pipes which form part of the divisible assets; and they pointed out, moreover, that, in the absence of agreement, the works were to remain the property of the Company, though the City was to be entitled to one-half of their value.

This reply had the effect of putting an end to the negotiations; and it was generally thought that it would be useless to reopen them until the points in dispute had been satisfactorily settled. With the view of effecting this object, the Company suggested the reference of the matter to the Courts; and, by mutual consent, the two questions were laid before the Prefectorial Council on July 25, 1895. The Company's statement was sent in on the 4th of September following; but the City

did not reply to it for nearly five years—viz., on May 23, 1900. The Company's rejoinder was deposited on the 27th of February last. Recognizing the importance of putting an end to these disputes, the Directors decided in 1898 to formulate a fresh project which they hoped might lead to an amicable settlement, and at the same time enable them to effect the much-desired reduction in price. But the Municipal Council took no further notice of it—appearing to abandon all idea of coming to any arrangement with the Company. They asked the Prefect, in the matter referred to him, to confine himself to the settlement with the Company of the conditions under which their property would be transferred to the City on Dec. 31, 1925; at the same time claiming the gratuitous relinquishment of the distributing plant

There were, however, some other parties concerned in the dispute—namely, the public, who clamoured loudly for a speedy solution of the price question; and after the constitution of the new Municipal Council last year, many propositions were put forward. Under these circumstances, the Directors considered it to be their duty to submit a fresh scheme to the Prefect of the Seine; and this was done on the 27th of June. Negotiations were carried on all through the summer with the Prefectorial Administration; and, after many concessions on the part of the Company, a contract was drawn up under the provisions of which the price of gas would be reduced to 20c. per cubic metre (4s. 6d. per 1000 cubic feet) from Jan. 1, 1901. The Municipality were to take possession on that date of the whole of the Company's property; two-fifths of the purchase-money to be borne by the Company, who were to "farm" the undertaking, for a period of 25 years, and the surplus by the City on Dec. 31, 1925. This scheme was referred to the First Committee of the Municipal Council in October; but it was opposed by the Prefect of the Seine. The Committee nevertheless continued their study of the subject, and requested the Directors to withdraw several important clauses—notably the one relating to the payment of the City's portion of the purchase-money. Regard for the shareholders' rights would not, however, permit of the acceptance of such a proposal.

At this juncture, several members of the Municipal Council who were desirous of seeing so beneficial a project, from the public point of view, carried into effect, interested themselves in the matter, and introduced a fresh proposal. The Directors encouraged their efforts, and wished them success. Negotiations were actively carried on, and eventually two schemes for contracts—one between the City and the Company, and the other between the City and the proposed "farming" Company—were referred to the First Committee, who, as the result of equal voting in both cases, decided to present them to the Municipal Council. The Council refused to consider them in detail; and they were sent back to the Committee, accompanied by the various propositions brought forward during the debate. When the Directors' report was issued, the Committee were engaged in examining the various matters submitted to them.

On the 14th of February last, the Directors were asked by the Prefect of the Seine if they were willing to consider with him a fresh combination, having for its object the reduction of the price of gas to 20c. per cubic metre from Jan. 1, 1902. Under this arrangement, the City would pay the Company the difference of 10c. per cubic metre, and bear the burden of the capital expenditure on the works in excess of that required for the normal development of the consumption. The Prefect expressed the opinion that the rights and interest of the Company under their Treaty of 1870 should be respected; this document constituting the law affecting the parties. The Directors replied on the 5th ult. that they had always shown themselves, and were still, ready to study any combination which would give satisfaction to the consumers without compromising the rights of either the Company or the City. At the same time, they pointed out that the creation of new assets belonging to the City exclusively would introduce a condition of things which would differ so materially from that now existing as to necessitate a preliminary understanding—first, as to the terms under which the Company would transmit to the City their right to the existing assets; and, secondly, as to the amount to be paid by the City before taking possession. Particulars regarding the new scheme were laid by the Prefect before the Municipal Council in a Bill introduced on the 13th ult. He stated that the solution of the various questions raised depended largely upon the decision of the Prefectorial Council in the proceedings then pending.*

In conclusion, the Directors said they thought the shareholders would acknowledge that they had put forth every effort in their power since June last to come to an amicable understanding with the Municipality on the question of reducing the price of gas; and they were ready to reopen negotiations with them whenever invited to do so.

Bombay Gas Company, Limited.—In the report to be submitted at the ordinary meeting of this Company on the 9th prox., the Directors state that, notwithstanding the prevalence of plague and famine, they are gratified at being able to report very satisfactory progress in the Company's business during the past year. The revenue shows a total increase of £6597, of which £136 was derived from the public lamps, £2699 from private rental, and £3456 from residual products. The quantity of coal carbonized was 2666 tons more than in the preceding twelve months. On the other hand, the cost of maintenance of retorts, purifying, and other items show a diminished expenditure. The loss by exchange, amounting to £12,551, is £2537 less than in 1899, chiefly due to the coal used having been principally native, and paid for in silver. After adding £2500 to the reserve fund, and deducting the interim dividend paid on the 1st of December last (£7200), the balance for distribution, with the amount brought forward, is £9368; and the Directors recommend a dividend of 3½ per cent. free of income-tax, making 6½ per cent. for the year, carrying forward £968.

* The pleadings closed on the 26th ult.; and the decision of the Council was given on the 1st inst. Stripped of its verbiage, it is to the effect that the application for the settlement of the points at issue between the parties must be dismissed, with costs against the City. The decision has placed the Company in a better position for ascertaining the exact value of their share of the undertaking at the end of their concession.—ED. J.G.L.

BIRMINGHAM CORPORATION GAS SUPPLY.

Growth of the Gas Undertaking—£410,000 Needed.

Last Tuesday, Mr. F. H. Tulloch, M.Inst.C.E., held an inquiry, at the Council House, Birmingham, into an application made by the Corporation to the Local Government Board for sanction to the borrowing of £410,000, for the capital purposes of the gas undertaking. The details of the requirements of the Corporation in regard to this portion of the municipal property having been supplied to the Board, the Town Clerk (Mr. E. Orford Smith), in addressing the Inspector in support of the application, confined himself to a brief exposition of the position of the Corporation. He explained that on March 31, 1900—the completed year for which the returns were made up—the total amount authorized to be borrowed by the Corporation, taking annuities at twenty years' purchase, and including the sum of £250,000 sanctioned by the Local Government Board on May 15, 1883, was £2,250,000. The amount actually raised at the same time amounted to £2,204,805; leaving £45,195 still remaining to be borrowed. The whole of this sum had since been expended; but it was insufficient to meet the requirements in respect of the new works. In justification of the present application, he drew attention to a few statistics showing the remarkable growth of the gas undertaking in Birmingham. In 1876—the first complete year of the Corporation's working—the capital expenditure stood roughly at £2,084,000; the quantity of coal carbonized was 299,000 tons, and the quantity of gas produced 2386 million cubic feet; the gas rentals amounting to £344,000. Ten years later, the capital expenditure had increased to £2,328,000; the coal carbonized, to 350,000 tons; and the output of gas, to 3298 million cubic feet. At the end of the next ten years, the capital expenditure had been reduced, owing to special circumstances, to £2,180,000; the coal carbonized was 515,000 tons; and the gas sold amounted to 4859 million cubic feet—an enormous increase. In 1899-1900, the period fixed by him for the purposes of the inquiry, the capital expenditure was £2,379,000; the coal carbonized, 534,000 tons, and the gas sold reached the enormous quantity of 5597 millions—the rentals being £580,000. Having shown the growth in the consumption of gas, the Town Clerk pointed out that on acquiring the gas undertaking the Corporation had to establish a sinking fund after five years; the period for the redemption being 85 years afterwards. They commenced to form a sinking fund immediately; and whereas on March 31, 1900, the statutory amount they had been required to place to it was £155,000, they had set apart in addition, quite voluntarily, £429,978—making a total of £585,000. The sinking fund at the present time was large enough to repay the whole debt at the end of the specified time without any further addition being made. But the Council intended to continue setting aside accumulations, so that they might be relieved of the debt at a very early period. The amount had been treated as a sinking fund in the books; but as the Gas Committee were willing to pay 4 per cent. to it for the purpose of obtaining the money for expenditure on capital account, £126,000 had been used in this way. However, the Local Government Board thought it would be better that the money should be treated strictly as a sinking fund, and that the capital expenditure of the Corporation should be met by necessary loans. Hence this £126,245, which had already been expended, was included in the amount for the raising of which sanction was asked. There was another item of £239,501 for miscellaneous works, contracts let and signed; two smaller sums of £35,000, principally for mains; and £9000 for contingencies—making a total of £409,499. Mr. Henry Hack and Mr. Charles Hunt, the Gas Engineers to the Corporation, gave evidence in regard to the various items for which the money is required. There was no opposition to the application.

RESULTS OF THE YEAR'S WORKING AT ROTHERHAM.

A Loss on the Gas Supply.

Last Wednesday, at a Meeting of the Rotherham Town Council in committee, Mr. C. H. Moss, J.P., the Borough Comptroller and Auditor, presented his annual financial statement on the working of the various departments of the Corporation for the year ending March 25. Alluding to the Gas Department, he said that the accounts were sufficiently near completion to enable him to submit the figures to the Committee. The great increase in the price of coal, and the heavy sums paid for renewals and alterations in the works, had sadly spoiled the results of the year's working. The income showed an increase of £2123 from sales of gas, and of £1700 from sales of residuals. The expenditure showed an increase of £4421 for coal, and an increased cost of renewals of works amounting to £1516. Depreciation of meters and fittings had absorbed an additional sum of £415; and the loan charges were heavier by £542. The final result was a net profit of £1845, after paying loan charges, as compared with £4189 for 1899-1900; and after allowing for the gas used for public lighting (£2564), there was a net deficit of £719 on the year's working, as compared with a surplus of £2034 for 1899-1900. The increased charges for gas did not appear to have realized as much as was estimated, the consumption by the larger users having evidently fallen off. The coal carbonized in 1899-1900 was 24,871 tons, at an average cost of 11s. per ton. In the year just closed there were 24,258 tons carbonized, at a cost of 14s. 11d. per ton. The production of gas per ton, and the cost of stoking, compared very favourably with preceding years; but, of course, the price of coal had overwhelmed everything.

Speaking at a public function the same evening, the Mayor (Mr. G. Gummer), who is also Chairman of the Gas Committee, referred to the proposal of a tax on export coal, and spoke of the coalowners as "gentlemen whose rapacity could not be satisfied." A short time ago, he said, they had increased the price of coal from 1s. to 5s., and in some cases 10s. per ton; and now the coalowners were arguing that the coal trade was going to be destroyed because they would have to pay a tax of 1s. per ton. He could tell the coalowners one thing they had done; and it was that they had added greatly to the burdens of Rotherham. He was sorry to have to say that the gas-works—which

used to be a most profitable undertaking, and would be so again he hoped in the future—would have, at the next meeting, after paying the interest on the loans and the needful repayments, to declare a loss upon the year's working. They had always been able in the past to give something out of the gas profits towards the relief of the rates ; but this year when the financial returns were completed, instead of there being a sum to be given to the rates, there would be a deficit of from £700 to £800. This meant that, through the increased cost of coal, the money would have to be found in some other direction.

GAS AND WATER FINANCES AT HUDDERSFIELD.

At the last Meeting of the Huddersfield County Borough Council, Alderman Woodhead, the Chairman of the Finance Committee, brought forward the estimates for the current financial year. In the course of his remarks in moving their adoption, he stated that it was proposed to take £3456 (equal to 2d. in the pound) from the gas-works fund, and contribute £1728 (equal to a rate of 1d.) to the water-works fund in aid of the deficiency on revenue account. Alderman Stocks, the Chairman of the Gas Committee, said his Committee doubted the wisdom of the Finance Committee in taking from them a sum amounting to a 2d. rate. He had not been able to obtain a statement as to their returns for the last quarter, and consequently he could not tell them what the amount of the profits had been for the past year. The policy of taking this amount was the more to be regretted, because the Committee had overhanging them a suspense account of £36,000. This was a heavy burden ; and he strongly approved of what the Chairman of the Finance Committee had said in regard to undertakings like gas and water having a substantial reserve fund, in order that they might meet any contingencies or accidents that might happen without having to come upon the rates to make up the deficiencies. Last year the profits amounted to £6639 19s. 1d. They had had an increase this year of about £9000 or £10,000 in their coal bill, and could easily see where their profits had gone to. It would be necessary to go on this year without carrying anything towards the suspense fund ; and all the while the interest upon it would be increasing. He contended that this was not a time when £3456 should be taken from them for the relief of the rates. He would inform the Council that for the coming year they would have to pay for coal an extra £19,000 or £20,000, as compared with what it cost three or four years ago. They might have cleared off the suspense account by now if the Council had not continued to take money from them ; and he would have been able to reduce the price of gas. They had in past years milked the cow until it was dry ; and, as a result, they had to spend £96,000 in restoring the animal. They were now adopting the old policy—milking and milking the cow before it had been properly restored ; and he warned the Council that, if this policy were persisted in, he or his successor would ultimately have to come to them for a rate-in-aid. Alderman E. Woodhead agreed with the spirit of the remarks of Alderman Stocks, and said he believed the financial policy he outlined was good and sound. With the present state of the rates, however, they could not do without the assistance of the Gas Committee ; and he hoped the gas-works would do better than Alderman Stocks anticipated, and be able to stand what had been taken from them. Next year they might see better what the position was.

The Water Committee reported that the Borough Treasurer had submitted the statement of the water-works revenue for the year ended the 31st ult., showing a debit balance of £6057 ; and it had been resolved that the amount be provided for by a rate-in-aid of 1d. in the pound, and the balance transferred to the depreciation account.

The estimates and minutes were passed.

RIVER PLATE GAS COMPANY, LIMITED.

An Abortive Proposal to Amalgamate the Buenos Ayres Companies.

The Annual Meeting of this Company was held yesterday week at River Plate House, Finsbury Circus, E.C.—Mr. A. E. Bowen in the chair.

The Secretary (Mr. Ernest Heald) read the notice calling the meeting ; and the Directors' report and the statement of accounts, from which particulars were given in our issue for the 16th inst., were taken as read.

The Chairman, in moving the adoption of the report and accounts, said the Directors were pleased at being able to present to the shareholders what they thought would be considered a good account of their stewardship, as the year had been for them, in common with most other gas companies, a very anxious and trying one. In their own case, they had to face conditions which he hoped and believed were not likely to occur again for a long time. He alluded to the rise in the cost of coal, and the great advance in freight to Buenos Ayres which ruled during the last six months of 1900. He felt sure the shareholders would agree with him in thinking that, as they had held their own, and even made £7300 more profit than during the previous year (when they had not to contend with any of these adverse circumstances), none of them could have any doubt as to the future of the Company. To a very great extent, the excellent result was due to the ability and energy of the Chairman of their Local Committee (Don Meliton Panelo) and to their hard-working and able Manager (Don Adolfo Gabarret). At the meeting last year, he (the Chairman) mentioned that the Company had still under contract at cheap prices a large proportion of the coal they would require for 1900 ; but, of course, for the balance of their supplies, they had had to pay a very high price. This, however, was not the worst feature. The freight market went very much against them, with the result that the coal carbonized cost, on an average, 3s. 4d. per ton more than in 1899 ; and, as they used some 44,250 tons, the increase amounted to a good round sum. He was glad to say the Directors did not enter into any large contracts at the high prices, and that already they had bought coal this year at nearly normal figures. Turning next to the proposal (which emanated from influential people connected with Buenos Ayres in November last) for an amalgamation of the Company with the Buenos Ayres (New) Gas Company and the Primitiva Company, he said that, after considerable discussion, the Directors entered into an *ad referendum* agreement, by which the Company were to receive £12 in shares of the new Company to be formed for each £10 share, the Buenos Ayres (New) Company were to receive a £10 share for £10, and the Primitiva Company a £10 share for each $50 share—the debenture debt to be taken over by the amalgamated Company. The Directors were given to understand, by the people who proposed this business, that they controlled a sufficient number of the Primitiva shares to ensure the acceptance of the scheme ; but it turned out that such was not the case, as the Primitiva shareholders, considering they were not getting sufficiently good terms, threw out the project, and decided to make themselves into a separate and independent English Company. As such, the Directors would be pleased to continue the very cordial relations they had lately had with them and the Buenos Ayres Company. Referring to the accounts, the Chairman stated that the revenue for the year was £96,669, as against £89,326 in 1899 ; and the gross profit was £97,603, as compared with £91,408. This the Directors considered very satisfactory, in face of all the adverse circumstances. On the upkeep of the works and mains £20,847 had been spent ; and they had the authority of their Chief Engineer (Mr. Rowbotham) for saying the works and mains were in first-rate order. The water-gas plant erected at the Corrales works had been a great success ; and it increased the capacity of the works by 800,000 cubic feet per day. The consumption of gas was 5 per cent. more than in the previous year, and the quantity of coal carbonized was 2300 tons more. With their residuals, they did much better than before ; and the increased price at which they were able to sell the coke helped the year very considerably—at the end of the year, in fact, they were almost out of coke. Owing to the increased sale of gas, their taxes were heavier than in 1899. During the year, 17 miles of mains were added to their system, in pursuance of the policy of pushing out into the best suburbs. The total length of mains was now 363½ miles The net gain of customers in the year was 688, making the total 25,355 ; and the number of street lights increased by 316, making the total 7096. He had the satisfaction of announcing the intelligence that the Directors had received a telegram to the effect that a contract had just been concluded with the Municipality, for seven years, for a considerable number of incandescent lamps, in addition to the street lighting already possessed. The Electric Companies were pushing their business ; but they had only taken from them 51 gas consumers during the year. The Municipality had continued the paving and repaving of the city ; and the Company had followed with the laying and revision of their mains. In 1900, 40,269 metres of mains were removed and revised, as against 32,724 metres in 1899. They had changed the sizes and modified 10,018 metres, against 7467 metres, besides taking up 2339 metres of mains which were duplicated. All this cost a lot of money, which was charged to revenue. During the year, £20,000 more debenture stock was sold. The London office expenses increased from £9783 to £12,521—due entirely to the augmented income-tax, which was going to be worse than ever this year. Capital expenditure had been £41,444, against £34,758. Other items were referred to by the Chairman ; and, concluding his remarks, he said he had not the slightest fears as to the future of the Company being both sound and progressive.

Mr. C. P. Ogilvie seconded the motion. In the course of his remarks, he gave an account of his impressions during a recent visit to Buenos Ayres. Incidentally, he said there was a point which the shareholders of all foreign gas companies would be thinking about, and that was the tax the Government had put on exported coal. In their own case, it meant that the cost of the gas sent out of their works would be something like 1d. per 1000 cubic feet more. Their officers in Buenos Ayres struggled hard to get the cost of manufacture down ; and if they succeeded in reducing it by ¼d. per 1000 cubic feet, they thought they had done a good thing. But here they had to face at one stroke an extra cost of 1s. per ton. In this connection, he referred to the advantages they would receive from the use of the recently erected carburetted water-gas plant.

The motion was unanimously adopted.

A dividend at the rate of 8s. per share, free of income-tax, making 7 per cent. for the year, was declared ; Messrs. Hegan and Le Rossignol were re-elected to their seats at the Board ; the Auditors were re-appointed ; and all connected with the direction and management of the Company at home and abroad were heartily thanked for their devoted services.

Kidderminster Water-Works Disclosures.—Under this heading, the "Birmingham Post" last Thursday published a paragraph to the effect that at the meeting of the Kidderminster Town Council the previous day—the Mayor (Alderman P. Adam) presiding—a resolution passed at the meeting of ratepayers ten days since on the water question was formally presented by the deputation then appointed. Mr. H. E. Purkis, the Chairman of the town's meeting, said there was a strong public opinion in the town that something further ought to be done in regard to the water-works question. The resolution was to the effect that the ratepayers consider that, as the statistics on which the resolution to put in new engines and sink the new well were based on what they believed to be unreliable figures, it would be advisable to have further figures carefully taken by a properly qualified person, who had the confidence of the Council and the burgesses ; and that as the present Chief of the Engineering Department had admitted tampering with the figures of the pumping, the ratepayers suggest that his services be dispensed with. The deputation having withdrawn, the Mayor moved that the whole matter, and the resolution which had been presented, be referred to a Committee composed of the Chairmen of all Committees of the Council. Mr. Tomkinson seconded the resolution ; and Alderman Hepworth (the Chairman of the Water Committee) supported it. He said he courted the fullest investigation. The resolution was eventually carried, and also a second resolution that the Vice-Chairmen of Committees should form part of the Committee to whom the subject was referred.

ELECTRIC LIGHTING OF ARTISANS' DWELLINGS.

The Borough Electrical Engineer of West Ham (Mr. J. K. Bock) has prepared a report on the above subject, some extracts from which have recently been given in the "Electrician." He remarks therein that when it was decided to fit up the electric light in the Bethell Avenue houses, and to make a charge of 6d. a week for current, there was no precedent in regard to the cost of supplying the electric light to artisans' dwellings; and consequently that must be regarded as a test case. In order to gain an idea as to the actual consumption of current in these dwellings, a meter with a demand indicator was installed to register the total quantity of current used in each block of houses. By treating each block as one consumer, it is possible to show the difference between the actual price and that which would have been obtained if the current had been sold by meter. The readings ranged from July to January—the heaviest half of the year. If current is sold by meter, a deduction of 1½d. per week from the income from each dwelling is necessary to provide interest and repayment on the additional capital expenditure incurred by installing meters. The annual saving in the cost of cleaning, painting, &c., must also be considered; and as the Corporation, as owner, benefited by that, Mr. Bock thinks it is justifiable to charge a portion of the cost of the electric light to repairs and maintenance. The following are the figures for the two quarters:—

Quarter ended Sept., 1900.	Block 1 (20 Tenements) 14 Weeks.	Block 2 (16 Tenements) 14 Weeks.	Block 3 (18 Tenements) 11 Weeks.
Units registered by meter	105 at 7d. 500 at 2d.	137 at 7d. 348 at 2d.	150 at 7d. 232 at 2d.
Price by meter	£8 10s. 10d.	£6 17s. 11d.	£6 6s. 2d.
Average price per tenement per week by meter	7¼d.	7¼d.	7¼d.
Average price obtained	6d.	6d.	6d.

Quarter ended Jan. 4, 1901.	Block 1 (20 Tenements) 14 Weeks.	Block 2 (16 Tenements) 14 Weeks.	Block 3 (18 Tenements) 18 Weeks.
Units registered by meter	192 at 7d. 1404 at 2d.	160 at 7d. 1186 at 2d.	246 at 7d. 1259 at 2d.
Price by meter	£17 6s. 0d.	£14 11s. 0d.	£17 3s. 4d.
Average price per tenement per week by meter	1s. 2⅞d.	1s. 3½d.	1s. 1d.
Average price obtained	6d.	6d.	6d.

Average price per tenement per week for the half year, if sold by meter (deducting 1½d. for repayment of meters) . . . 9½d.
Average price per tenement per week received for the half year (deducting 1½d., the cost of lamp renewals, &c.) . . 4½d.

Mr. Bock remarks: "In order to place the artisans' dwellings on the same basis as ordinary consumers, it is necessary either to increase the charge per week, to instal ordinary meters and demand indicators, or to instal prepayment or penny-in-the-slot meters. If the prepayment meter is adopted, it will be necessary to arrange a fixed price per unit at which the light will be supplied. The present charges for electricity are 7d. per unit for an average of one hour per day, and 2d. for all units after Accordingly, if the light is used for an average of one hour per day, the average cost would be 7d. per unit; for two hours, 4½d.; for three hours, 3⅞d. The whole question of the cost depends on the probable period during which the maximum number of lights are used." In conclusion, Mr. Bock makes the following four suggestions: (1) That prepayment meters be installed in all the artisans' dwellings. (2) That any consumer may have a prepayment meter installed for a private dwelling if the installation does not exceed 3 amperes (five 16-candle power lamps at 100 volts, or ten 16-candle power lamps at 200 volts). (3) That the charge per unit, if prepayment meters are used, should be 4½d. per unit (at this rate one 8-candle power lamp would cost 1d. for seven hours). (4) The prepayment meters should only be installed at this rate in private dwellings. By adopting this course, all dwelling-houses are offered the same terms as the artisans' dwellings.

ELECTRIC LIGHTING NOTES.

Last Wednesday, the Mayor of Wigan (Mr. T. Fyans) opened, with the customary ceremony, the electrical works which have been erected by the Corporation at a cost of nearly £100,000.

A poll of the parochial electors of Fakenham was taken a few days ago on the question as to whether or not the scheme for lighting the town by electricity should be adopted. The Gas Company issued a circular to the ratepayers some days before the poll, offering to supply the town lamps with gas for £187 per annum on a contract for three years (instead of £275 as asked by them in July last), and also holding out inducements to certain of the ratepayers who at present are not benefited by the light. The number on the register was something like 600; and out of this only 279 recorded their votes. The presiding officer declared the result as 110 in favour of the scheme and 165 against it; so that it was lost by a majority of 55.

The Directors of the Salisbury Electric Light and Supply Company have just issued their report and statement of accounts for presentation at the fifth annual general meeting of the shareholders. The report states that the progress made by the Company during the past year was satisfactory. The number of consumers increased from 148, with 6228 lamps connected, to 210, with 9795 lamps connected; while the sales went up from £1165 to £2320. The profit on the year's working amounted to £1568 10s. 4d. After writing off the debit balance from last year of £206 7s. 9d., and payment of £1230 19s. 6d. interest on debentures and loans, there remains a balance of £131 3s. 1d. available for dividend on the ordinary shares. The Directors recommend that a dividend be paid at the rate of 3 per cent. per annum on the ordinary shares; and carrying forward a balance of £21 10s. 1d.

Our enterprising electrical contemporary "Lightning," which has lately adopted the sub-title of "The Electrical Times," has for some few years contained an elaborate analysis of the accounts of electric light undertakings in the hands of both companies and local authorities, to which we have on numerous occasions referred our readers for statistical information. The tables now appearing are for the year 1899, and they show that in that period the working of the electric light undertakings by the Local Authorities of the following towns resulted in deficits to the extent stated: Ayr, £696; Barrow, £706; Bath, £1363; Bedford, £288; Burton, £5; Cardiff, £1794; Cheltenham, £1507; Coventry, £1745; Dublin, £2823; Ealing, £642; Eccles, £789; Hanley, £2269; Kingston, £48; Leith, £650; Leighton, £1465; Lincoln, £467; Morley, £1404; Redditch, £931; Salford, £2028; Shrewsbury, £645; South Shields, £73; and Stafford, £375.

The electric lighting and dust destruction scheme prepared by Mr. H. P. Maybury, the Gas Engineer and Surveyor to the Great Malvern District Council, was discussed at a crowded meeting of ratepayers of Malvern Link on Monday evening last week. Mr. Maybury having answered a number of questions put to him on the subject, Mr. Whatley said he thought, if it was good enough for a private company to hazard their shareholders' money on an electric lighting scheme in Malvern, it was good enough for the Council to do so; and they ought to run the scheme, so as to prevent their gas consumption being robbed from them by the competition of a private electrical company, with a consequent loss of profit on the gas and a corresponding charge upon the rates. Mr. Yapp pointed out that there were 76 towns where the electric light was in the hands of local authorities; and while 54 of them were making handsome annual profits, 22 showed deficiencies. Mr. Powell gave a statement as to the income and expenditure of the Wallasey scheme (upon which the Malvern scheme was based), and showed that for the year's working there was a deficiency of £936. He considered the deficit at Malvern on the first year's working would be nearer £1000. Mr. Badham spoke of the heavy rates now levied by the Council, and moved—"That, seeing the tremendous indebtedness of the Malvern Council in perfecting the gas-works, and the rates being higher than working men can bear, the present time is most inopportune for the introduction of electric lighting." Mr. Foster supported the motion, and pointed out that Redditch had just levied a special rate of 1s. in the pound, owing to a deficiency arising from the electric lighting. If Malvern undertook this expensive risk, he thought the Council would have to do something similar. The motion was carried.

COMPARISON OF GAS AND ELECTRICITY.

A Gas Manager's Defence of Gas.

Some time ago, the Electric Lighting Order granted to the Hertford Corporation in 1891 was transferred to the North Metropolitan Electrical Power Distribution Company, Limited, who are proceeding with the erection of their supply station and the laying of cables. The Hertford Gas Company therefore find themselves confronted with a competitor. In these circumstances, their Manager and Secretary (Mr. Robert Watson) lost no time in laying before their customers a few simple and unexaggerated facts in regard to the comparative cost of gas and electricity as lighting agents. As they may prove useful to some of his colleagues similarly placed, we give them below.

Light Produced from Gas-Burners.

(*a*) Gas consumed with an incandescent "C" burner at the rate of 3¾ (say 4) cubic feet per hour, will produce an average light of 50 candles. Hence 1 cubic foot of gas yields over 12½ candles, and 1000 cubic feet yield over 12,500 candles.

(*b*) Gas consumed through a good burner, at the rate of 5 cubic feet per hour, will produce a light of 15½ candles. Hence 1 cubic foot of gas in this case yields 3·1 candles, and 1000 cubic feet yield 3100 candles.

Light Produced from Electric Incandescent Lamps.

The electric lamps in general use absorb about 4 watts per candle (*vide* "Electrician," Vol. XLIV., p. 153). Hence the Board of Trade unit of electricity (1000 watts) will produce 250 candles. Therefore—

(*a*) 50 units are required to yield 12,500 candles.

(*b*) And 12⅖ units are required to yield 3100 candles.

Comparison of Cost.

(*a*) 1000 cubic feet of gas, producing (with the incandescent gas-burner) 12,500 candles, cost 3s. 9d.
50 units of electricity at 5d., producing 12,500 candles, cost 20s. 10d.

[Periodical renewal of lamps may be set off against renewal of mantles.]

(*b*) 1000 cubic feet of gas (used in the ordinary way), producing 3100 candles, cost 3s. 9d.
12⅖ units of electricity, producing 3100 candles, cost 5s. 2d.
[Cost of periodical renewal of electric lamps to be added.]

In the circular accompanying the foregoing comparison, Mr. Watson points out that the gas was that of his Company, of 15½-candle power as tested by the argand burner; and that the figure taken as the price per unit of electricity (5d.) might be considered to be a favourable average, in a town of the size of Hertford, of the Brighton system of charging. He then goes on to say: "It will be seen that the figures prove that electric light, as compared with gas consumed through the incandescent burner, is 5½ times, and, as compared with gas used in the ordinary way, some 1⅔ times, more expensive. . . . There are very few houses where incandescent gas-burners are not now in use. It may be taken, therefore, that where illumination is obtained partly with incandescent and partly with ordinary burners, the cost of electric lighting would be between three and four times as great—in other words, the lighting bill would be more than trebled. The experiences of those who have discarded gas for electricity confirm these statements. The very high lighting power of the incandescent gas-burner makes it far and away the cheapest method of lighting; and its efficiency is undoubted. Incandescent burners are sold at moderate prices; the 'C' burner costing 3s. 6d. Where flat-flame burners are preferred, the comparison is still greatly in favour of gas; and with a suitable burner a good lighting effect can easily be obtained."

MESSRS. RICHMOND'S PROFIT-SHARING SCHEME.

Bonus Day at Warrington.

The Annual Meeting for the distribution of bonuses and dividends in connection with the profit-sharing scheme at the Warrington works of the Richmond Gas Stove and Meter Company, Limited, was held on Monday last week. Mr. E. W. T. RICHMOND, the Chairman and Managing-Director of the Company, presided; and upon the platform were Mr. J. A. Ransome, General Manager at Warrington, Mr. H. M. Thornton, General Manager of the Stratford Works, Mr. W. Glover (of Messrs. George Glover and Co., Limited, now amalgamated with the Richmond Company), and the principal officials at Warrington.

Mr. RICHMOND opened the proceedings by expressing the pleasure it gave him to meet the employees of the firm on the occasion of the fourth profit-sharing distribution. When the scheme was started, the concern was much smaller than it was now, and there were not nearly so many men participating in the profits. For the first half year, in 1897, the sum of £358 was distributed; in 1898 the amount was £905; in 1899, £1150; and for 1900 it was £1891, including £1131 to be distributed that day and £760 already paid out at the Stratford works. The bonus this year was increased to 6¼ per cent., which was half of the dividend paid by the Company to the ordinary shareholders. Previously it had been 5 per cent., because the general dividend was 10 per cent. The past year had been the most successful in the Company's history; and in producing the satisfactory results obtained, each one of them had done his share. This year, however, they had to face a reduction in the price of the goods they sold. It had been agreed upon in the trade to take off the 5 per cent. advance they had previously put on, which meant that while their materials had been paid for at the high rates, they were now selling their goods at lower prices. This meant a diminution in the profits on the goods sold; and if they were to maintain their success, they would have to make up for this by increased economy. He therefore appealed to the workmen to guard against any waste of time or material, while turning out the best class of work they could. Every stove which left the place perfect was an advertisement which brought in orders for three more. They had done well, and he did not want them to go back—indeed, he wished them to do better still, if possible. If the workmen did their best in the way he had indicated, they might rely upon it that profit-sharing would be continued. He might further mention that the whole of the 2500 £1 preference (6 per cent.) shares originally reserved for the scheme had now been distributed, and it had become necessary to create more capital to provide for the continuance of the scheme. Probably this would amount to about £10,000; and shares in it would be issued, when arrangements had been completed, in return for the provisional certificates which were being distributed that day. Another point which had occupied his attention was as to whether some scheme could not be started whereby the employees of the firm would be provided for in old age. He was desirous of seeing some plan by which anyone who had been in the Company's employ up to the age of (say) 60 or 65 should be assured against want as long as he lived. The Company would not be justified in doing more than they were at present doing; and such a scheme of superannuation as he had suggested would have to be provided for by contributions from the men themselves. But he might have more to say about this matter on some future occasion.

Mr. RANSOME proposed a vote of thanks to Mr. Richmond for coming among them to distribute the profits in connection with the scheme, and pointed out the importance of the individual efforts of the employees in maintaining and increasing the business—the success of the profit-sharing scheme depending entirely upon this.

Mr. DAVEY (Works Manager) seconded the motion, which was supported by Mr. HUGHES (Cashier) and Mr. THORNTON.

One of the workmen who had been "at the front" gave expression to the pleasurable surprise with which he had learned that, although he had been away in South Africa, he was to receive his share in the profits just the same as if he had remained at home.

Mr. RICHMOND acknowledged the vote of thanks, and afterwards distributed to the men, as they filed out of the works, the envelopes containing the scrip and dividend.

As mentioned above, the distribution of bonuses took place at the Stratford works of the Company on the 20th inst. Mr. Richmond presided, and in the course of his address to the men explained that this was the third distribution in London under their profit-sharing scheme, and he was pleased to say that it was larger and affected a greater number than in any former year. In 1898, when sixty employees participated, the number of fully-paid £1 shares allotted was 138, cash to the amount of £49 1s. was distributed, and £2 13s. 4d. was paid into the savings bank. Five men in that year took up shares. In 1899 the number of participants had risen to 116, 301 shares were allotted, £40 was deposited in the bank, and 24 shares were taken up. This year the results were even better; the shareholders had received 12½ per cent., and the employees were entitled under the scheme to 6¼ per cent., or 1s. 3d. on every £1 earned during the year. More than 200 employees were interested; and he was going to distribute 668 shares. Besides this, £68 had been paid into the bank. It was also a source of satisfaction to find that 50 other shares had been taken up by nearly as many men.

The water accounts of the Huddersfield Corporation for the past financial year show a deficit of £6057, to meet which a rate of 1d. in the pound has been levied—the balance being charged to depreciation.

The Chancellor of the Exchequer informed Mr. D. A. Thomas last Friday, in answer to a question put by him as to whether pitch used in the manufacture of patent fuel will be liable to the new coal duty, that the 1s. per ton will be leviable on the total weight of manufactured fuel exported, irrespective of its constituents.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1113.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb.	101—103	+2	4 17 1
200,000	5	Nov. 14	6⅔†	Bombay, Ltd.	6—6⅞	..	5 0 0
40,000	5	,,	6⅔†	Do. New, £4 paid	4¾—4¾	..	5 9 5
380,000	Stk.	Feb. 14	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New	187—192	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref.	128—132	..	3 15 9
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb.	113—116	..	3 9 0
220,000	Stk.	Mar. 14	10	Brighton & Hove Orig.	222—227	..	4 8 1
226,320	,,	,,	7	Do. A. Ord. Stk.	160—165	..	4 4 10
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max.	121—123	..	4 1 4
420,000	20	Mar. 28	10	British	40½—41⅛	+⅛	4 16 5
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c.	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c.	19—21	..	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	9—10	..	6 0 0
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—100	..	4 0 0
150,000	20	Mar. 14	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	14½—15½	..	5 3 3
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55	..	5 9 1
550,000	Stk.	Apl. 12	12	Commercial Old Stock	275—280	..	4 5 9
236,425	,,	,,	9	Do. New do.	205—210	..	4 5 9
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	165—170	..	5 5 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	163—168	..	4 3 4
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	120—125	+5	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 14 1
486,090	10	Jan. 31	11	European, Ltd.	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,079,885	Stk.	Feb. 14	4 4/10	Gas-light and Coke — 4 p.c. Ord.	94—96	+1½	4 11 8
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	89—92	..	3 16 1
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	110—113	..	3 10 10
4,063,425	,,	Dec. 13	3	Gas-light and Coke — 3 p.c. Con. Deb.	94—96	+1	3 2 6
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13⅝—14⅝	..	5 10 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental	215—220	+3	4 10 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A	234—236	..	4 4 9
678,100	,,	,,	7	Do. do. B	170—173	..	4 0 11
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd.	4⅜—5¼	..	5 14 3
560,000	100	Apl. 1	5	Met. of — 5 p.c. Deb.	104—107	..	4 13 5
250,000	100	,,	4½	Melbourne — 4½ p.c. Deb.	102—104	..	4 6 6
541,920	20	Nov. 14	3½	Monte Video, Ltd.	9½—10⅜	..	6 13 4
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.	226—227	+½	3 14 11
312,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	101—102	..	3 8 8
150,000	5	Nov. 29	8	Oriental, Ltd.	7—7⅛	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6—6⅛	..	5 10 9
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
					*Ex. div.		
60,000	5	Feb. 28	7	Ottoman, Ltd.	5⅞—6¼	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord.	10⅝—11⅛	+⅛	6 4 5
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—99	..	4 0 10
250,000	10	Mar. 28	8	San Paulo, Ltd.	11—12	..	6 13 4
135,000	Stk.	Mar. 14	10	Sheffield A	235—240	..	4 3 4
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
523,408	,,	,,	10	Do. C	234—236	..	4 4 9
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	130—133	+4	3 15 2
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb.	93—96	..	3 2 6
380,940	Stk.	Nov. 14	5	Southampton Ord.	108—113	..	4 8 6
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham and — A. 5 p.c.	112—117	..	5 1 8
250,520	,,	,,	4½	Tottenham and — B. 3½ p.c.	84—89	..	5 0 0
80,100	,,	Dec. 13	4	Edmonton	109—114	..	3 10 2
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—102	..	4 18 0
230,000	5	Feb. 28	9	West Ham, 10 p.c.	9—10	..	4 10 0
147,000	10	,,	6	Do. 7 p.c.	11⅛—12½	..	4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord.	295—300	..	3 13 4
150,000	,,	,,	5	Do. 5 p.c. Pref.	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	140—145	..	3 2 1
175,785	,,	Mar. 28	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord.	188—193	..	3 12 6
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	145—150	..	3 0 0
797,687	,,	,,	3	Do. 3 p.c. Deb.	95—97	..	3 2 6
700,000	50	Dec. 13	8	Grand Junction — 10 p.c. max.	107—110	..	3 12 9
310,000	Stk.	Mar. 28	4	Grand Junction — 4 p.c. Deb.	123—127	..	3 3 0
708,000	Stk.	Feb. 14	14	Kent	300—305	..	4 12 5
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—205	..	3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max.	270—280	..	3 15 0
406,200	100	,,	8	Do. 7½ p.c. max.	207—212	..	3 15 5
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb.	123—126	..	3 3 6
500,000	100	Feb. 14	13½	New River, New Shares	407—412	..	3 6 9
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and — Ord.	188—193	..	3 12 6
126,500	100	,,	7	South-wark and — 7½ p.c. max.	177—182	+2	3 16 11
489,200	Stk.	,,	5	South-wark and — 5 p.c. Pref.	153—158	..	3 3 3
1,019,585	,,	Apl. 12	4	Vauxhall — 4 p.c. A Deb.	124—128	..	3 2 6
1,155,066	Stk.	Dec. 13	10	West Middlesex	265—275	..	3 12 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
200,000	,,	Mar. 14	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
					*Ex. div.		

† Next dividend will be at this rate.

MONTREAL LIGHTING AMALGAMATION.

Reference has already been made in the "JOURNAL" to the projected amalgamation of all the lighting interests in the city and district of Montreal; and the following particulars of the scheme were given in a recent number of the "Financial News": Hitherto there have been three Lighting Companies operating in Montreal—the Montreal Gas Company, the oldest organization, with a capital of $2,997,704; the Lachine Hydraulic Company, who obtain their power from the famous Lachine Rapids, with a capital of $3,000,000; and the Royal Electric Company, with a capital of $1,500,000. Mr. Forget, who has the scheme in hand, and is a member of the Montreal Stock Exchange, was elected President of the Royal Electric Company two years ago. He at once perceived what great advantages would result from a consolidation of all the lighting interests, and quietly set to work to bring this about. He and his associates, by purchasing the stock on the open market, finally secured a controlling interest in the Gas Company—their most formidable competitor—and when the plans had been matured, the necessary measure was submitted to the Quebec Legislature. In face of formidable opposition, the Bill has just been secured, giving extensive powers to a new Company, to be known as the Montreal Light, Heat, and Power Company, who propose to take in all the lighting undertakings. The Gas and Royal Electric Companies have already authorized the amalgamation. The Lachine Company still hold out; but it is regarded as only a question of time when this concern will also be absorbed. The work of organizing the new Company is proceeding. It will have a capital of $25,000,000, of which $17,000,000 will be underwritten at once.

WASHBURN VALLEY (LEEDS) WATER SCHEME.

Arbitration Proceedings.

Last Tuesday, arbitration proceedings were opened at the Leeds Town Hall, for the purpose of assessing the amount of purchase-money to be paid by the Leeds Corporation to Mr. Charles Booth Elmsall Wright, of Bolton Hall, Clitheroe, Lancashire, in respect of the compulsory acquisition from him of lands situate in the Washburn Valley, and required by the Corporation in connection with their water-works. The lands in question consist of four farms, containing a total area of about 334 acres. Mr. W. F. TEMPEST was Arbitrator for the claimant; Mr. J. W. DACRE for the Corporation. Mr. W. H. WELLSTED, of Hull, was the Umpire.

Mr. CRIPPS, K.C., in opening the case, referred to the land as a choice residential estate, with fishing and shooting rights. It was upon such a basis, he submitted, that a true valuation should be made; and upon it the property had been valued at from £25,000 to £27,000. On the other side, it was suggested that, in order to arrive at a proper valuation, it was necessary to capitalize the commercial value of the different items of the estate—so many years' purchase of the rentals obtained from the farms—and the fishing and shooting rights. There was an obligation on the part of the Corporation to send down from Swinsty to Lindley 5,631,840 gallons of water every 24 hours. It would be greatly to the advantage of the Corporation to be free from this obligation, because they could then convey the water by gravitation from Swinsty to Leeds, and save the cost of pumping.

Mr. *T. Fenwick*, of Leeds, expressed the opinion that it would be most unjust to value the land, which was in a most picturesque district in the centre of Yorkshire, as agricultural. For residential purposes, he valued the estate at £24,221. The Folly Hall and Snowdon farms he put down at £19,919; and a detached piece of land, consisting of allotments, and a grouse moor covering 69 acres, at £1380—the two sums amounting to £21,300, including timber, shooting, fishing, and riparian rights. Allowing 10 per cent. for compulsory purchase, the amount reached £23,430; and reckoning £791, or £7 10s. per acre, for the depreciation of the 105 acres of the estate not required by the Corporation, the entire valuation reached £24.221. The depreciation of the 105 acres would be due to the division of the estate.

Mr. *J. Farrer*, Mr. *Gilston Martin*, and others, were called to support Mr. Fenwick's valuation.

Mr. MANISTY, K.C., submitted that the estate could be regarded as agricultural only. There were great objections to it as a residential estate. It was difficult of access; and, on the face of it, an area of 400 acres was too small for a desirable shooting-box. Yet for such an estate no less a sum than £24,000—twice its agricultural value—was asked. The net amount received by the owner in rents from the estate required by the Corporation was only about £267 per annum. On a rental value, £24,000 would represent 90 years' purchase; and it would necessitate the expenditure of another £1000, roughly speaking, to put the property into thorough repair. The total value of the land required by the Corporation had been estimated at £9053 by experts called in by the Corporation.

Mr. *Charles Gott* said he did not think any depreciation would result from severance. There was no likelihood of the rents of the farms increasing, as agricultural rents were more likely to go down than up. The customary basis upon which to fix the value of agricultural property was 28 years' rental; and upon this basis the estate was worth £7485 To this was to be added £504, the estimated value of the shooting and fishing, together with 10 per cent. for compulsory purchase (£798) and £265 for timber; making a total of £9053. From this, however, £1000 would have to be deducted for repairs and improvements, leaving £8053 as the net value.

Mr. *G. H. Crowther* said the estate was not marketable as residential property. The water supplies to the various farms were as primitive as they were a hundred years ago.

Other evidence for the Corporation having been given, the inquiry was adjourned till the next morning, when Counsel addressed the Umpire, who will make his award in due course.

SUTHERLAND'S
PATENT
PREPAYMENT GAS-METERS

SPECIAL FEATURES:

Accuracy of Measurement.

Simplicity of Construction.

Excellency of Workmanship and Material.

EVERY METER GUARANTEED.

THE SUTHERLAND GAS-METER COMPANY
ESSEX WORKS, BIRMINGHAM.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week the most important event within my view has been the inauguration of the new gas-works at Perth, which was done with suitable ceremony yesterday. The works have, as a matter of fact, been in use since the end of November last; and the Corporation were thereby greatly helped in their winter work—not to speak of the comfort which was experienced, in his labours, by Mr. W. B. M'Lusky, the Engineer and Manager. They are situated in a position of great natural beauty, a circumstance which gave rise to considerable *badinage* in the course of the after-dinner proceedings. Mr. Macfie having called attention to the fact that so beautiful a place was taken up with a gas-works, Lord Provost MacGregor explained that in Perth no site could be found which was not beautiful, and that they had chosen one of the worst they could find in this respect. This by the way. There is no doubt the works have been planted in the midst of very fine scenery; but this would avail little unless the position were also one which could be utilized with profit. On this score, also, there can be no doubt. They are in close proximity to the railway, from which sidings run into them at both high and low levels; they are at the lowest point of the district of supply; and they are on the banks of the River Tay, by means of which raw material could be brought in should occasion require, and be landed upon the city quay, a short distance away. The appearance of the works is a little unique, in this respect—that there is no gasholder in view. At present, andf or some time to come, all the gas which will be required will be stored in the two existing holders, at the Shore, one of which is wire-rope guided, on the system of Messrs. Ashmore, Benson, Pease, and Co. It may also not escape observation that the buildings are exceedingly plain in design. They are substantially and well built, as was remarked in the course of the inaugural view; but ornamentation has been eschewed, I suppose, in the interests of economy. It will be remembered that there was a difficulty, in the early stages of the movement for the translation of the works, about the cost. The Gas Commissioners were prepared to expend £52,500 upon the new works; and plans for these were prepared by Mr. G. P. K. Young, of Perth. When, however, tenders were received, it was found that the cost would greatly exceed the sum available. A process of reduction was entered upon; and Mr. W. Foulis was consulted on the plans. On his advice, the proposed works were cut down so as to bring the cost, it was expected, to the necessary amount. When all had been agreed upon, Mr. A. Gillespie was appointed Engineer for the erection of the works. This arrangement has proved a great benefit to all. On account of the congested state of the existing works, the Manager's duties were so heavy that it would have been impossible for him to have satisfactorily superintended the building of the new works. Since Mr. Gillespie's appointment, in 1899, the operations have gone on rapidly; and the beautiful works which have been opened are the fruit of his labours. Details of the total cost are not yet completed; but it is said that, exclusive of the enclosing walls and the levelling of the site, the outlay incurred will not exceed £45,000. Mr. Foulis visited the works on Monday; and, after going carefully over and inspecting them, he reported to the Convener of the Gas Committee of the Corporation that he was very pleased with all he saw, that the works reflect credit on Mr. Gillespie and on the Contractors, and that he is confident they will prove to be both satisfactory and profitable to the Committee. Mr. M'Lusky thus gets into his hands an instrument with which he may do much for the benefit of the community of Perth As to appliances, he is now in the front rank; with regard to capacity for extensions, it is practically illimitable. Even in the works which have been erected there is room for the doubling of nearly the whole of the plant; so that, for many years to come, extensions of works must be but a small item in the accounts. Of Mr. M'Lusky's ability to make the most of the works, no one doubts. In this translation, the Corporation of Perth have shown a wisdom which they could not always be congratulated upon possessing. They have, however, risen to the occasion at last; and, this being so, they are entitled to all credit for what they have done. That there will be doubting hearts among them, over this business, may be looked for; but this will not alter the fact that a great step forward has been taken, which will be highly profitable for the community.

On such occasions as yesterday, the mind has a tendency to dwell on the future—it is more filled with anticipation than with retrospect. At Perth, the past was brought before the assemblage in a way which was not only sufficiently forcible to prevent its being overlooked, but which was so skilfully and appropriately done that, looking back upon the scene, it is felt that to have left out the ceremony at the old works would have been to leave a great blank in the day's proceedings. Those who saw the venerable Mr. T. Whimster turn the steam off the exhauster will not soon forget it. The last throb of the engine meant the cessation for ever of works which have been going on day and night for three-quarters of a century, and of which Mr. Whimster himself began to have the supervision half-a-century ago. It is impossible to avoid the rise of regretful feelings at such a time. What were Mr. Whimster's feelings I cannot say; but we all know that he had always a buoyant nature—a youthful spirit—and we can understand that even he was not so much moved at the thought of the works which were the product of his mind passing out of existence, as he would be exercised as to the vicissitudes of the future in the gas supply of the city. He has been out of harness for several years; and the closing of the scene of his long service would not come to him with the wrench which it would have done had he been still in command. Everyone was pleased to see Mr. Whimster in good health; and I am sure that no one will be found who will not echo the wish of the Lord Provost that he may be spared for many years to enjoy the gifts which he received at the hands of the Corporation. The honour that was done to Mr. Whimster, who, down to the latest day he served in the gas-works, was in the very forefront in all matters pertaining to gas manufacture and supply, was of equal interest with the opening of the new works. To himself it must be

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

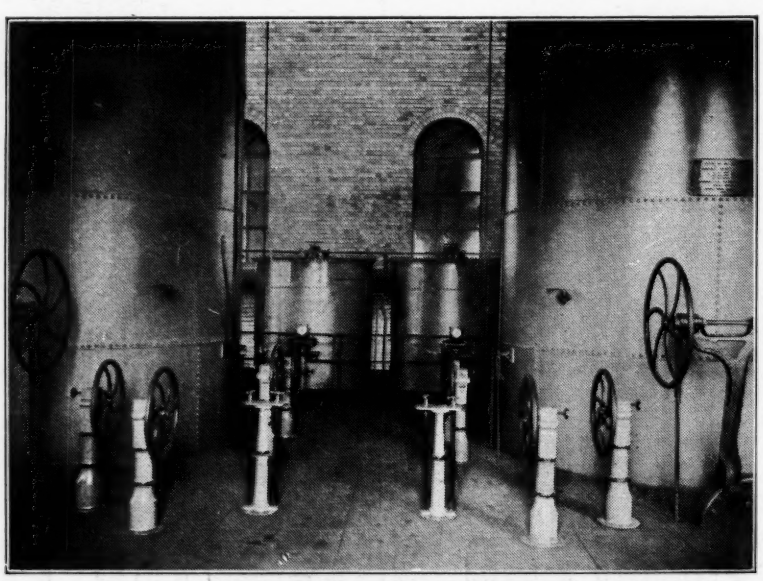
The Economical Gas Apparatus Construction Co., Ld.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

CARBURETTED WATER-GAS ENGINEERS.

THE M.-W.-P. PLANT is designed to use the Heaviest as well as the Lightest Grade of Oil.



RESULTS PROVE EFFICIENCY.

Working Floor of Generator House. One Quarter Section of Birmingham Plant, Windsor Street Station.
The Maximum Daily Capacity of the Birmingham Corporation's Plant, which was erected by this Company, is 10 MILLION CUBIC FEET.

specially gratifying to know that he has still "troops of friends" in the city where he laboured so long. To outsiders it was a cheering and encouraging sight—cheering as a manifestation of gratitude, and encouraging as a reminder to any who may be disposed to weary in their toil, that meritorious work, long continued, and probably tiresome, will not go unrewarded.

The works were not shown in a kid-gloved style, but in their ordinary aspect. The coal-breaker, in particular, was being put to a severe test—the severest, in fact, to which it could be put, for it was being fed with Muirkirk cannel, which has the reputation of being the hardest of all coal. It had been thoroughly tested; and it was found to be impossible to choke it. This gives a high character to the machinery supplied by West's Gas Improvement Company. The same may be said of their mechanical stoking plant. It was evident that the charges were being laid with an evenness which would satisfy the most fastidious of hand stokers. This was apparent from the unsurpassable equality of the coke; there being not a particle of green coal to be seen.

Although the great International Exhibition in Glasgow will not be opened to the public till Thursday next, it may be said to have been laid open to comment by the Press view which took place last Thursday To those who were present, it may have appeared that the Press view might with advantage have been postponed for a day or two, as there was still very much which was not in a position to be either viewed or reviewed. But we ought to be charitable in such matters, and in that spirit I presume the day for the Press view was fixed comparatively early with the intention of inducing people to hurry up in the placing of their exhibits. It was almost futile to expect the effect to follow, because an exhibit once placed requires attendance; and most people will prefer to begin to pay their attendants next week instead of this. All the same, the purpose of a Press view is advertisement; and this was easily compassed, notwithstanding that there were many things which will make the Exhibition an attraction, the importance of which could not be measured, either because they were not there or because they could not be seen in operation. It was fortunate that one of the most complete sections in the Exhibition was the lighting department. In this regard it is matter for congratulation that gas has secured so large and important an area in which to show what it is capable of doing.*

The valuation of the undertaking of the Stirling Gas Company has been fixed by the Assessor of Railways and Canals at £2600, which is over £200 less than it was last year.

One of the measures which have been considered by a Parliamentary Commission sitting in Glasgow this week, under the Private Bill Procedure Act of 1899, was the Glasgow Police Provisional Order. Among the other proposals in the measure was that the lighting of common stairs should be undertaken by the Corporation; the cost to be assessed equally upon owners and tenants. Lord Provost Chisholm explained the matter. He said that for the lighting of public streets the estimated expenditure was this year £37,800, the whole of which came upon the occupier only. The estimate for the lighting of private streets and courts was £6500. The cost of erecting the lamps fell upon the owner, who paid 15s. per lamp per annum for upkeep. It was estimated that the Corporation would recover, at that rate, a sum of £3550; leaving a deficiency of £2950 payable by the occupiers. The tendency of this deficiency was to gradually increase. He thought that it was inconsistent with the intention of the Act that any portion of this rate should be paid by the occupiers. The lighting of common stairs was estimated to cost £37,500. The owners were bound to maintain the necessary fittings at their own expense, which seemed just enough. They were also charged 10s. per burner per annum for the supply of gas, labour, &c. This rate was estimated to enable the Corporation to recover a sum of £21,650; leaving a deficit of £15,850, which had to be charged upon the general police assessment. The Corporation proposed to meet the whole cost of lighting by a uniform rate upon landlord and tenant. The lighting of common stairs enhanced the value of a house by giving it a safe, convenient access. At present, the tenant bore a most unjust and inequitable share of the cost of that lighting; and the deficit ought not to be allowed to fall upon the occupier. For the collection of the assessment and bad debts, the owner was allowed a rebate of 20 per cent., whereas there was no extra trouble about the collection of the rate, as it was the universal practice to collect it along with the rent, and it was a fruitful source of complaint that the landlord did not confine himself to 20 per cent. For instance, where a property with a single light had three tenants, the proportion of cost upon each should be 3s. 4d.; but the landlord, it was alleged, exacted 5s. Complaints regarding this had frequently been made to members of the Town Council and in the public Press; and this was one of the reasons why they were anxious to get rid of the system. He saw no justification for the whole of the cost of the lighting of public streets being thrown upon the occupier. The great bulk of the assessments of the city were levied half on landlords and half on tenants. In putting forward this proposal, the Corporation were actuated only by the desire to do what was just and equitable. Opposition was offered on behalf of the Landlords' Association; and the Commission gave effect to it. While granting the remainder of the Order, they refused the powers sought with reference to lighting.

* Special articles on the lighting arrangements and the Exhibition generally will be found on pp. 1108 and 1118.—ED. J.G.L.

On the recommendation of the Water Committee, the Hyde Town Council have decided to make application to the Local Government Board for power to borrow £7500 for extension of the water-mains in the district.

Under the auspices of the Galway Gas Company, a gas exhibition was held in Easter week by the Richmond Gas-Stove and Meter Company, Limited, which proved very interesting. The hall was also tastefully lighted with the newest designs in "Simplicitas" and "Surprise" fittings, which showed the incandescent light under the most artistic conditions.

C. & W. WALKER, Ltd.

Midland Iron-Works,

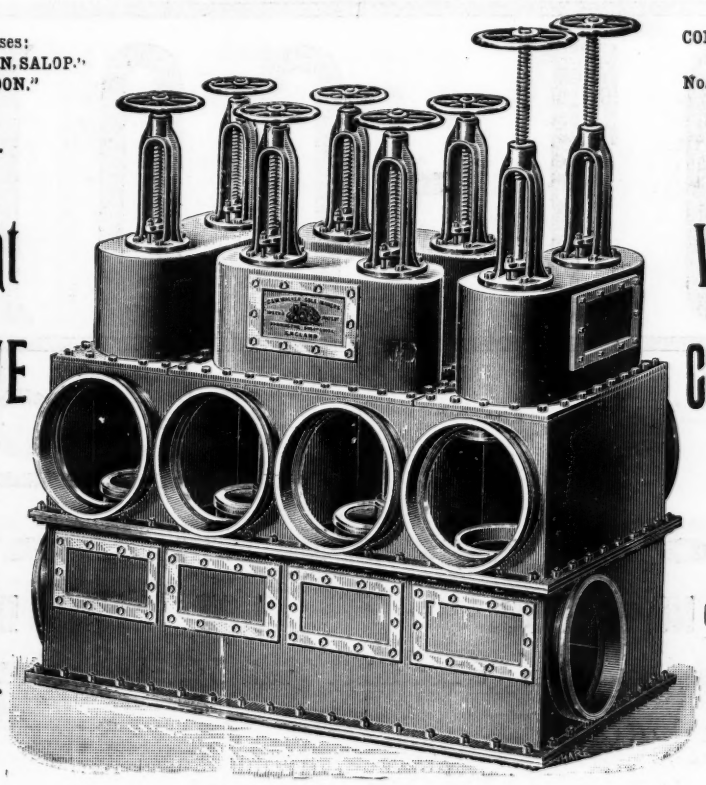
DONNINGTON, Near NEWPORT, SHROPSHIRE.

110, CANNON STREET, LONDON, E.C.

Telegraphic Addresses:
"FORTRESS, DONNINGTON, SALOP."
FORTRESS, LONDON."

CODES USED: A.B.C. AND A.1.
Telephone:
No. 12 WELLINGTON, SALOP.

Weck's Patent CENTRE-VALVE



Weck's Patent CENTRE-VALVE

PERFECTLY TIGHT UNDER EVERY EXTREME OF HEAT OR COLD.

THE ONLY ABSOLUTELY RELIABLE CENTRE-VALVE IN THE MARKET.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April 27.*

Sulphate of Ammonia.—Throughout the week, there has been improved demand for immediate and early delivery, and there has been a recovery from the depression experienced during the month. The buying has, however, been mainly for covering contracts taken in advance, and, production from gas-works being now much reduced, there has been a difficulty in covering April requirements. The closing quotations are £10 2s. 6d. to £10 5s. per ton delivered f.o.b. at the ports. There has also been considerable inquiry for delivery ahead; but the efforts of buyers have been directed to getting in at recent prompt delivery current prices, and these have not met with much success, owing to the firmness of makers.

Nitrate of Soda is quiet at 8s. 4½d. to 8s. 6d. per cwt. for ordinary and refined qualities, respectively, on spot.

LONDON, *April 27.*

Tar Products.—The markets are very dull; and there is an absence of business. Benzol is especially weak. Large sales are reported at 9d. per gallon f.o.b. casks included, while it is stated that proportionately lower prices have been accepted at makers' works in the Midlands. There is an entire absence of Continental inquiry; and the aniline trade appears to be in a very bad state. Pitch is decidedly weaker, as is usually the case at the end of the shipping season. Tar oils are fairly well maintained, especially as regards London. Crude carbolic remains in the same position; the demand for 60's being very good up to the end of June, although at present consumers do not care to purchase for July-December. Salts are scarcely so firm, and several parcels are being offered on the market; the recent hot weather having made producers anxious to clear out their stocks. Tar has decidedly a downward tendency; but there is nothing important to report, no large contract having been let during the past week.

The average values obtaining during the week are: Tar, 14s. to 17s. 6d. Pitch, east coast, 29s. 6d. to 30s.; west coast, 27s. to 27s. 6d. Benzol, 90's, 8d. to 9d.; 50's, 8d. Toluol, 1s. Crude naphtha, 4d. Solvent naphtha, 1s. 1d. Heavy naphtha, 1s. Creosote, 1¾d. to 1⅞d. Heavy oils, 2d. Carbolic acid, 60's, 2s. 6d. Naphthalene, 90s.; salts, 55s. Anthracene, "A," 3d.; "B," 2d. (nominal).

Since writing the above, a report is current that 8d. has been accepted for 90 per cent. benzol f.o.b. in the North.

Sulphate of Ammonia appears to have taken a slight turn for the better, doubtless owing to the business which is reported in the Beckton make. Sales have been made during the last few days at £10 2s. 6d.; and the Gaslight and Coke Company ask £10 5s. for May-June. There is also an improved demand at Leith, where, as a rule, makers ask £10 2s. 6d. for early delivery. Small sales are reported at Hull at £10; but most makers hold for £10 1s. 3d. to £10 2s. 6d., and in some instances ask even more than this.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Although the sudden change in the weather during the past week has tended to cause a less confident tone on the part of colliery representatives, in some instances, with regard to maintaining full current rates, the month closes with no material change in prices, and certainly with no general reduction. The position is that collieries are mostly still very short of supplies, and are absolutely bare of stocks. So that even a considerably lessened demand for house-fire purposes would in no way cause anxiety, but would only assist them in putting down coal on the pit-banks, and at the yards, which is really required in preparation for next winter's demand, as unless stocks are accumulated before the Whitsuntide holidays, there is very little chance of putting down very much afterwards. Prices may still be reported as steady at 16s. to 17s. per ton for best Wigan Arley, 14s. 6d. to 15s. for Pemberton four feet and seconds Arley, and 13s. to 14s. for common house coal at the pit-mouth. The lower qualities of round coal are moving off but indifferently for steam and forge purposes; and supplies of these are ample, with prices, if anything, gradually easing down, owing to increasing quantities offering from other districts. Common sorts of steam and forge coal could be bought at from 11s. to 11s. 6d. per ton at the pit-mouth. The gas coal and locomotive fuel contracts are still in suspense; but colliery owners are beginning reluctantly to recognize that a very substantial giving away on last year's prices will be necessary. In some instances, it is practically admitted that they may possibly have to get back to very near the basis of two years ago. In many quarters, however, colliery owners are apparently maintaining a very determined attitude; but it is questionable whether they will be able to hold out when the real test, in the shape of competition from other quarters, has to be definitely faced. Derbyshire will undoubtedly be a very keen competitor for the locomotive fuel contracts; and Yorkshire in a similar manner will, in all probability, fight much more strenuously for the gas coal contracts than has been the case during the last two or three years. For engine fuel, Lancashire prices are fairly steady at about recent quotations; and there is less of that forcing down of rates to secure business. There are, however, plentiful supplies of cheap slack offering from other districts; and in the open market prices are very irregular. At the pit-mouth, common Lancashire slack averages 7s. to 7s. 6d. per ton, and the best qualities 8s. 6d. to 9s.; medium Derbyshire slacks can be bought at from 4s. 6d. and 5s., and Staffordshire and Yorkshire slack from 6s. and 6s. 6d. upwards. Shipping is only quiet, with prices about as last quoted—12s. to 12s. 6d. being the average figure for steam coals, delivered at the ports on the Mersey. Coke has been steadier; and in some instances rather better prices have been got, as compared with the low cut rates of a few weeks back, good washed Lancashire furnace cokes not being quoted under 12s. 6d. to 13s. per ton, with foundry coke ranging from 24s. to 26s., according to quality, at the ovens. The proposed export duty on coal continues, of course, a matter which is

MAURICE GRAHAM.

THE "GRAHAM"

HOT-COKE

"SECOND

Now working at the

ABSOLUTELY NOISELESS. HOT COKE DRAWN FROM

Engineers should visit this Works and

SOLE MAKERS:

actively concerning the coal trade. But outside the coalowners, shippers, and miners, it is, as intimated last week, regarded rather favourably than otherwise; and even on the Manchester Coal Exchange a resolution condemning the proposed new tax was only carried by a narrow majority.

Northern Coal Trade.—The effect of the imposition of the duty and of the agitation against the coal-tax have been very marked in the coal trade of this district; and the influence has not been confined to coal for export, but has in degree been felt in other branches of the trade. Steam coals have naturally been most affected, because so large a proportion of this class is usually exported. Best Northumbrian steam coals have been shipped under bond; but the quantity is much less than in the previous week. The price is nominally without much change at 12s. 6d. per ton f.o.b.; while steam smalls are 6s. to 6s. 3d. In the gas coal trade, the exports have been a little reduced; but the home shipments are good for the time of the year. Prices for best Durham gas coals are now from 9s. 3d. to about 9s. 9d. per ton f.o.b.; but there is only a moderate inquiry—the large contracts having in several cases been fixed, while others are held back through the duty. It is probable that in a week or so the position will have been decided; and prices may then be more settled. In the coke trade, exports are less; but there is activity in the home trade, and there is a larger consumption. Best Durham coke for export is about 17s. 6d. to 18s. per ton f.o.b.; blast-furnace coke is 14s. 6d. to 15s. per ton, and is in fuller request. Gas coke is now less plentiful, and the quotation is from 12s. to 13s. per ton f.o.b.; but this may be influenced by the fate of the coal duty ultimately.

Scotch Coal Trade.—The trade is still in suspense, although the Chancellor of the Exchequer has agreed to consider contracts already entered into. Contracts for such large quantities are being lodged that the situation is not cleared, but the contrary, by the announcement. If abatement be given upon them all, there will be so little export left that the duty will not be worth collecting. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 10s. 6d. to 11s. 3d., and splint 10s. 6d. to 11s. The shipments for the week amounted to 186,346 tons—an increase of 15,635 tons upon the preceding week, but a decrease of 21,003 tons upon the corresponding week of last year. For the year to date, the total shipments have been 2,492,738 tons—a decrease upon the same period of the previous year of 501,577 tons.

Artesian Borings in Queensland.—The drought in the interior of Queensland has been much mitigated as to its effects by the great success which has attended the sinking of the artesian wells. In eight years 424 were put down at a cost of £1,000,000. Of these, 300 overflowed to an extent that would fill a reservoir more than a mile long by 200 yards wide and 20 feet deep daily, or in a year a similar canal 45 miles long. The last returns to hand give a total of 715 of these wells; taking the flow of water from 311 bores, we arrive at the startling record of 192 million gallons per 24 hours—the maximum from any one bore being 4 million gallons daily.

Stafford Water Supply.—The supply of water to Stafford during the last financial year resulted in a gross profit of £2403, which is £216 less than in the previous twelve months. The net profit was £526; and £500 has been placed to the credit of the district fund in relief of the rates.

New Water-Works for Looe.—The Looe District Council met last Friday to consider tenders for the construction of the East Looe section of the new water-works. Five offers for the construction of the reservoir, large mains, &c., were received; the amounts ranging from £1950 to £1270. The lowest—that of Messrs. W. H. Thomas and Co., of Camborne—was accepted. For iron pipes the offers were from £5 4s. 6d. to £6 5s. per ton; and for valves, hydrants, &c., as per specification, from £67 6s. to £121 17s. 6d. per ton. The Council accepted the lowest of these tenders also.

The Minutes of the Gas and Electricity Committees of the Coventry Corporation.—A motion brought before the Coventry City Council, at their fortnightly meeting on Tuesday last, by Mr. W. Lee, to instruct the General Purposes Committee to revise the Standing Orders next October, so as to enable the Gas and Electric Light Committees to present the minutes of their proceedings for confirmation by the Council, gave rise to a long discussion. He said he tried eight years ago to bring the Gas Committee under this rule; but the then Chairman (Alderman Andrews) declared that what he asked for was impracticable. The present Chairman, however, was of opinion that it was the proper thing to do. He (Mr. Lee) was quite sure that it would be for the benefit of the Council, and the Committees concerned also, if they reported their proceedings to the Council, and asked for their confirmation. Mr. Rotherham (Chairman of the Gas Committee) seconded the motion, because this was in effect nothing but a statement of principle—that all Committees of the Council should be subject to the general jurisdiction of the Council itself. This principle he took to be a very necessary one; and he could see no valid argument against it. Alderman Andrews said there was no objection to the resolution, so far as the Electric Light Committee was concerned; but he saw a strong objection to it as far as the Gas Committee were concerned. The former was not a trading Committee like the latter, but was on the same footing as the Water Committee, whose only expenditure consisted in buying local coals, and who sold one article, the price of which was fixed by the Council. The Gas Committee were very different; and he would move an amendment that the part of the resolution referring to that Committee be omitted. He wished to tell the Council plainly and, through the Press, the Coventry public, that if the affairs of the Committee were published it would cause an increase in the cost of gas. He advised the Council to leave well alone. Alderman Booth seconded the amendment. Mr. Johnson supported it, and asked Alderman Andrews if he would include the Electric Light Committee, because he believed what applied to one applied equally well to the other. Alderman Andrews agreed, with the consent of the seconder, to alter his amendment as suggested. After some further remarks, the resolution was carried by a large majority.

PATENT Nos. 24,659-1899 & 11,979-1900.

CONVEYOR

TO NONE"

Gas-Works, LEEDS.

RETORTS AND QUENCHED IN "OUR PATENT CLOSED TROUGH."

See THIS PATENT CONVEYOR WORKING.

GRAHAM, MORTON, & CO., LTD., LEEDS.

Manchester Gas Profits and the Rates.—A meeting of the Finance Committee of the Manchester City Council was held last Thursday, to consider the amount of the city rate to be recommended to the Council for adoption at the meeting of that body to-morrow. Upon the estimates laid before them, the Committee, it was understood, agreed to recommend an addition to the present rates of the city of 4·9d. in the pound. An opinion was expressed that the Gas Committee should so revise their estimates as to enable them to make a larger contribution to the city fund. The contribution made by the Gas Committee last year was upwards of £51,000; but in order to realize this, the price of gas, it will be remembered, was increased 3d. per 1000 cubic feet. This year, as already mentioned in the "JOURNAL," the Committee estimate an available surplus of £11,000; and it will only be possible to make an additional contribution by still further raising the price.

New Joint-Stock Companies.—The General Acetylene Lighting Company, Limited, has been registered with a capital of £1000, in £1 shares, to acquire, exploit, work, and turn to account any patents or processes relating to acetylene gas, and to carry on any business connected with the production and supply of such gas. No initial public issue will be made. The Perranporth Water Company, Limited, has been formed, with a capital of £8000, in £10 shares, to supply water to the township of Perranporth, in the parish of Perranzabuloe, and the village of Mithin, partly in the parish of St. Agnes and partly in the parish of Perranzabuloe, in Cornwall, and other places along, or adjacent to, the line of pipes or mains, and to carry on the business of a water company in all its branches. The Armoured Concrete Construction Company, Limited, has been registered with a capital of £5000, in £1 shares, to adopt an agreement with H. C. Werner, and to carry on the business of manufacturers of armoured and ordinary concrete, contractors, engineers, builders, consultants, &c.

Water-Works Purchase Scheme Rejected at Louth.—Last Tuesday, a meeting of ratepayers, convened by the Mayor of Louth, considered a proposal made by the Highways Committee of the Corporation to purchase the Louth Water-Works Company either by arbitration or on payment of a sum of £15,000. The Highways Committee, after deciding in favour of the purchase, obtained the opinion of Mr. James Mansergh, who, having examined the property, recommended that the Council should not offer more than £15,000. The Town Council offered £13,900, which was declined. The Highways Committee then recommended the Council either to increase their offer to £15,000, or to submit the matter to arbitration, which, Mr. Mansergh estimated, would cost between £2000 and £2500. The Company thereupon made arrangements for obtaining a supply of water to supplement their present supply from Welton; and the Corporation, having discussed the matter in committee, decided to take counsel's opinion upon the legality of such proceeding. The opinion received was against the Company; and the Mayor was asked by requisition to call a meeting. At the meeting, Mr. John Store moved that the Corporation be requested to take no further steps at present to purchase the water-works; and this resolution was carried amid much enthusiasm.

The Middlesex Gas-Meter Testing-Station.—The establishment of a gas-meter testing-station at Edmonton, by the Middlesex County Council, has been a profitable undertaking. It was opened under an arrangement with Messrs. T. Glover and Co., Limited, in July last, as recorded in the "JOURNAL" at the time, and fees to the amount of £949 have been received. The expenditure was only £678.

Gas v. Electric Lighting at Bath.—At a recent meeting of the Bath City Council, the Chairman of the Finance Committee (Mr. Mager) presented a statement showing that lighting ten years ago came to £6550 (gas £4400, electric light £2150), and at present the cost was £10,100 (electric light £5400, gas £4700). The rateable value of the city had increased during this time by £10,000; while the city debt had gone up no less than £302,500—from £134,750 to £437,250. There were 155 electric arc lights which had taken the place of 547 gas lights; but whereas the gas cost £1957, the electric light cost £4725.

Keighley's Successful Gas Undertaking.—Some interesting facts and figures in connection with the development of the municipal gas business at Keighley have lately been given by Alderman B. S. Brigg, in opening an exhibition of gas appliances at the Temperance Hall. He estimated that the foresight of the old Improvement Commissioners at Keighley in establishing gas-works so long ago as 1824 had saved the town a quarter-of-a-million of money. He especially emphasized the advisability of using gas instead of coal for cooking and heating, on account of the relief which the gas profits had afforded to the rates; and he mentioned that during the past ten years the Corporation had supplied 854 cookers, 693 heating-stoves, and 5473 smaller appliances.

Waste of Water at Budleigh Salterton.—Mr. F. Hammond, Engineer and Secretary of the Chepstow Water Company, has presented a preliminary report to the Budleigh Salterton Urban District Council, stating that on his first visit, in February, the diagrams of the Deacon meter showed a daily waste of 38,000 gallons. This amount was, however, reduced, by repairs to a joint in a hydrant, by about 500 gallons per hour. On his visit on the 18th of March, he found that the water was passing through the meter during the night at the rate of from 1000 to to 1200 gallons per hour. This night flow, which was entirely wasted, would represent a loss of something like 14 gallons per head per day, or nearly enough to supply the whole population. The waste he found was almost evenly distributed over the town. He recommended the employment of a man, with a knowledge of plumbing by preference, who would be supplied with a list of all premises furnished with the Council's water, and the authority of that body to make a house-to-house inspection. He should be instructed to draw up a report as to the number and class of fittings to each house, and whether they were in proper working order, and also whether there were any indications of leakage; and if any were discovered, a notice should be immediately served upon the person to abate the leakage, unless it was due to some cause under the Council's immediate control. If this work were now taken in hand, Mr. Hammond would on his next visit receive the inspector's report, and put him right in the event of any matter of difficulty occurring.

The "Main" Prize Medal Gas Cooker.

Prices, £2 10s. to £13 10s.

Strong, Durable, and Efficient.

R. & A. MAIN, LIMITED,

LONDON, GLASGOW, MANCHESTER, BIRMINGHAM, & BRISTOL.

Subways for Electrical Wires.—In the City of Baltimore (U.S.A.), an extensive system of city subways is in course of construction, and will shortly be completed. It has been ordered that all private owners of overhead lines (excepting tramway trolley lines) are to place their wires and cables in these subways, for which the following rentals are charged: Up to and including 5000 duct feet, 7 c. per duct foot per annum; above 5000 and up to 25,000 duct feet, 6½ c.; 25,000 to 50,000, 6 c.; 50,000 to 100,000, 5½ c.; beyond 100,000, 5c.

Strike at the Tyldesley Gas-Works.—A little friction between the Manager of the Tyldesley Gas-Works (Mr. W. H. S. Gendall) and the retort-house foreman led to the latter abruptly leaving the works early last week, accompanied by all the stokers. Fresh hands were procured to fill their places; but the supply of gas was so poor that many of the shops had to close in the evening. Investigation revealed the fact that the hydraulic mains had been run dry, and that a considerable quantity of air was being mixed with the gas. The defect was promptly remedied; but it was Wednesday before any considerable change was apparent. The Gas Committee of the District Council held a meeting on that day to investigate the matter, and came to the conclusion that the plant had been tampered with. Further inquiries were ordered to be made with the view of bringing the charge home to the guilty parties; and the assistance of the police was obtained to guard the works.

Well Water for Street Cleansing.—Twelve months ago the West Ham Corporation undertook a scheme of well boring for the purpose of obtaining a supply of water for the electric lighting stations, baths, stables, &c. Estimates prepared by the Borough Engineer (Mr. J. G. Morley) showed that a supply obtained from this source would result, after payment of capital charges, in a saving of between £300 to £600 per annum. The trial borings have been completed, and although the results have shown that an abundant supply of good, soft water is obtainable, the scheme does not possess those financial advantages which were originally claimed for it. According to the "Municipal Journal," the Borough Engineer points out that on the amended estimates the saving over the East London Water Company's bill would entirely disappear. His original estimate was based on the supposition that the capital could be borrowed at 2¾ per cent., but in the present state of the Money Market the annual charge would be increased by 1 per cent. The least profitable part of the scheme is that for the supply of water for highways, sanitary conveniences, and recreation grounds, as this would entail a large expenditure for mains, which would practically only be used for six months in the summer, and then only on dry days, while in winter and on wet days the mains would be almost stagnant. The highways, too, would require about 400,000 gallons in nine hours, for which large power would be necessary. Under these circumstances, the Borough Engineer recommends that at the outset the Corporation should confine themselves to the profitable side of the undertaking—*i.e.*, the supply of water for the baths, pumping and electric lighting stations, stores, and stables, where water would be taken in considerable quantities without a large outlay for mains. The modified scheme would entail an expenditure of £4670.

The National Registration of Plumbers.—A meeting of representatives of District Councils for the national registration of plumbers was held last Wednesday at the Guildhall, London. Reports were presented showing that, since the conference of health and water authorities and plumbers was held in Birmingham in October last, 2082 operative plumbers and 494 master plumbers had been registered, and that the applications for registration were so numerous that a large number still remained to be dealt with. It was decided to increase the facilities for the examination of applicants. Various arrangements for securing the more systematic training of plumbers were discussed; and, on the motion of Dr. Alfred Hill, Medical Officer of Health for Birmingham, it was resolved that apprenticeship should be encouraged in connection with the national registration of plumbers, and a special form of indenture for plumbers' apprentices, should be circulated for adoption throughout the kingdom.

The Accident at the Birmingham (Windsor Street) Gas-Works.—In the "JOURNAL" last week we reported a serious accident, on the 19th ult., to Mr. F. S. Green, the Works Manager at the Windsor Street Gas-Works of the Birmingham Corporation. Mr. Green was removed to the General Hospital, where, unfortunately, he succumbed to his injuries the next morning. An inquiry into the matter was held by the City Coroner (Mr. I. Bradley) last Tuesday, at which Mr. H. E. Brothers, the Factory Inspector for the district, was present. The widow of deceased was too ill to attend; but an inspector of police stated that she had told him that her husband had assured her that his trouble was the result of "a pure accident." Mr. Charles Hunt produced plans showing the capstan which was being tested when the deceased received his injuries. He said it could be stopped by shouting to the engine-house near, and this was done within a very few seconds after the disaster. Other evidence went to show that the Contractors' foreman told deceased on the previous Friday that the capstan was completed; and they and others proceeded to test it by shunting trucks. After a preliminary trial, the rope, instead of winding out, locked, and wound round the capstan at a terrific rate. A hook at the end of the rope caught Green's right leg, knocking him down; and before he could rise the slack rope coiled round his leg, and cut it off below the knee. He was hurled to the ground, fracturing his other leg and one of his arms. In the course of the evidence, the Inspector commented upon the fact that the capstan could not be stopped without going to the engine-house some yards away. He urged that such machines should each be under the control of a man, so that they could be stopped immediately anything went wrong. But it was stated that not more than three seconds elapsed between the locking of the rope and the catastrophe. Summing up, the Coroner expressed the hope that something might be done to prevent such accidents in future; and the Jury, finding a verdict of "Accidental death," concurred. Mr. Nadin and Mr. Atkins, on behalf of the Corporation and the Contractors respectively, expressed great regret at the fatality; Mr. Nadin adding that the deceased had been a most valued official, and one whose loss the Corporation Gas Department deeply deplored. Mr. Hunt promised that the matter should have full consideration.

IN SUMMER HEAT

USE

RICHMOND'S GAS STOVES

Hadley and Ketley Water Supply.—A special meeting of the Wellington (Salop) District Council was held last Wednesday, at which a proposal was brought forward by Mr. Clift, that the seal of the Council should be affixed to an agreement entered into with the East Shropshire Water Company, transferring to them the Council's right to supply the districts of Hadley and Ketley with water. Mr. Clift said the Council could assist the Company to obtain what they were unable to get granted to them in an Act of Parliament without their support. They had attended to the interests of their present customers at Ketley, and made a stipulation that the Company should not impose higher rates than those charged by the Council. Mr. Howes said the Council could not have undertaken to supply Hadley within the same period as the Company. He was convinced the steps the Council were asked to take were in the interests of all. It was resolved to seal the agreement.

The Fatal Gas Explosion at Sheffield—The inquiry into the circumstances attending the death of Frederick Maxfield, who died on the 7th inst. as the result of injuries received in the gas explosion at the works of Messrs. Walter Latham and Son, of Sheffield (see *ante*, p. 1017), was resumed at the Royal Hospital before Mr. D. Wightman, last Wednesday. The inquest was adjourned, it may be remembered, to allow the two men who were injured with the deceased to attend and give evidence. Edwin Sheldon said he was with the deceased and Ernest Walter Latham when the accident happened. On the morning of the 1st of April, about nine o'clock, they opened the door of a strong-room used for storing purposes. Latham detected a smell of gas, and they left the door open for about 20 minutes to allow time for the gas to clear. Latham told witness when they went back not to strike a light. They could not smell any gas, and therefore he lit the jet; but almost immediately there was an explosion. All three men were badly injured, and were taken to the Royal Hospital, where Maxfield died on the following Sunday. In reply to the Coroner, witness said the gas had escaped from the jet, which had been turned on since the previous Saturday afternoon. Deceased did not tell him not to strike a light. Ernest Walter Latham gave a similar account of the accident. He said it was he who should have turned the gas off on the Saturday; but the tap was loose, and probably it slipped on again without attracting his attention. It had done so the day before, and the plumber was to have attended to it. Mr. Charles H. Latham, a member of the firm, explained that the strong-room was about 13 feet high, and was lined with broad shelves, not very wide apart. As the door was only 5 feet high, the gas would clear from the open part of the room, and the place would seem safe, while a quantity of gas remained between the shelves. When the light was put to the jet, it was the gas between the shelves which was fired. When the accident occurred, Sheldon got out of the room uninjured; and it was only fair to him to say that he rushed back to assist Maxfield, who was in a nervous condition. He had been severely injured in doing so, and had, in fact, risked his life to try to save Maxfield. Mr. Latham added that the premises were new, and the gas-jets had not been properly attended to by the plumber. The Jury returned a verdict of "Death from injuries received in a gas explosion."

Water Supply by Meter.—Water-meters have been brought into general use by the Attleborough (Mass.) Water Board. Water was found to be wasted unnecessarily in very cold weather and in summer, while many fittings were added to the plumbing in buildings without notification to the Board; thus defrauding them of legitimate revenue. Inspection was found to be inadequate as a remedy for the waste, and meters were accordingly adopted after an investigation covering more than a year. Meters are sold to those consumers who wish to purchase, and they are rented to the others; but in either case the Board retain the right to inspect and test them whenever it is considered necessary. A minimum rate of $3 per half year is charged, for which 8100 gallons of water may be drawn. The meter-rents are $2 to $10 a year.

Margate Water Supply.—A meeting of the ratepayers of Margate was held a few days ago to protest against the further increase in the rates through the re-introduction by the Corporation of the Wingham water scheme, before it had been satisfactorily proved that there is not sufficient water in Thanet to meet Margate's needs. A resolution was submitted censuring in the severest terms the action of the Corporation, and expressing the opinion that they should not persevere with the scheme, the cost of which had been under-estimated by many thousand pounds. The Council were denounced as being unworthy of confidence. The resolution was carried with but little opposition; and a further proposition, asking the Local Government Board to oppose the Bill promoted by the Corporation, was adopted. The matter came before the Council the next day, when, in view of the adverse vote, a proposition to apply to the Local Government Board for sanction to a loan for extending the adits was rejected by a large majority.

Regenerative Retorts for the Ellesmere (Salop) Gas-Works.—Last Tuesday, Mr. A. A. G. Malet held an inquiry at the Town Hall, Ellesmere, into an application by the Urban District Council to the Local Government Board for sanction to a loan of £1000 for the erection of a new bed of regenerative retorts at the gas-works. The Clerk to the Council (Mr. R. E. Lloyd) said the outstanding loan on the undertaking was £5002; and the general district rate was 2s. in the pound. The amount spent in purchasing and improving the works was £7957; for they were found to be inadequate and old-fashioned. The present retorts, if in good condition, required 23 cwt. of coal to produce the same quantity of gas that the new ones would yield with 21 cwt.; while the life of the latter would be five years, as compared with the three years' working capacity of those now in use. The gas undertaking was a sound one, and not, as some people believed, one which did not pay. The average profits for the last seven years amounted to £391 13s. 8d. per annum, which nearly paid all their mortgage charges. Evidence having been given in support of the application, Mr. J. Hood said he protested against the loan, which he did not think was required in a small town like Ellesmere. Since the price of gas had been raised to 5s., there had been a large decrease of about 60,000 cubic feet per month. Mr. Lloyd said the Manager attributed the decrease to other causes. Some further remarks were made, and the inquiry closed. The Inspector's report is not yet known in the town.

JOSEPH AIRD
GREAT-BRIDGE.
STAFFORDSHIRE.
TUBES
AND FITTINGS
GAS, STEAM, WATER GALVANIZED-TUBES, &c.
LONDON OFFICES: 46, QUEEN VICTORIA STREET. E.C.

Intensified Gas in Manchester.—The "Manchester Courier" reports that the experimental lighting of Piccadilly with intensified gas has so far been satisfactorily carried out. It was reported to the Gas Committee on Friday that the illumination of the locality is superior to that which was previously obtained by the electric light, while the cost of the new system is much less than that of the other. The test, which has been going on for a month or so, will be continued until the end of three months before the Committee decide whether or not there are to be any further installations of intensified gas in the city.

Sales of Stocks and Shares.—Last Tuesday, Messrs. Herbert Morris and Son submitted to public auction £1000 of original capital stock of the Lewes Gas Company. It was divided into £50 lots; and the prices realized ranged from £94 down to £90—the average being £92 3s. Mr. J. W. Crosby held an important sale of Hartlepool Gas and Water Company's 5 per cent. maximum ordinary stock at the Company's Offices, West Hartlepool, last Thursday. Stock to the total value of £10,000 was submitted; and it was sold in lots of £100 each, at £126, £126 10s., £127, and £128 per lot. The object for which the additional capital is raised is the carrying out of the Dyke House and Crooksfoot extension works. In accordance with the announcement which recently appeared in the "Journal," Messrs. Alexander, Daniel, and Co. sold by auction last Thursday £15,000 of Bristol Water-Works 7 per cent. maximum consolidated ordinary stock, in lots of £100. The stock is part of the 7 per cent. stock, amounting to £690,000, created under the powers of the Company's Acts of 1888, 1889, and 1896. The highest price obtained per £100 was £162 10s.; the lowest, £160—the average being £160 5s. 10d. The total amount realized by the sale was £24,043 12s. 6d.

The Flash-Point of Oil.—Last Thursday, the Home Secretary (Mr. Ritchie) received a deputation from the London County Council on the subject of raising the flash-point of petroleum oil to 100° Fahr. For the Council, it was pointed out that Mr. Jesse Collings (who was present) gave a pledge on behalf of the Government to introduce a Bill dealing with the whole subject; but it had not been brought in. The Council felt that lamp accidents could be almost entirely prevented by raising the flash-point. The danger could not be got rid of by merely attempting to regulate the construction of lamps, because legislation on such lines would not touch millions of lamps now in use, nor would it prevent lamps becoming dangerous from use or accident. Mr. Ritchie, in reply, said he could not undertake that the Government would bring in a measure for raising the flash-point, as recommended by the Select Committee on Petroleum. While the resolution of the Committee to raise the flash-point was carried by a majority of one only, the arguments in the report of the Committee were against doing this. It was very doubtful if a higher flash-point would give security against accidents; but it was certain that such an alteration would seriously affect a large proportion of the oil brought into this country, and might be the means of increasing the price of an article largely used by the poor. Though he was unable, on this occasion, to reply favourably to the request of the deputation, he would give every consideration to the views of the County Council.

Gas-Works Extensions at Ripon.—Alderman Wells reported to the Ripon City Council on Thursday the result of an interview he had had with General Carey, one of the Inspectors of the Local Government Board, with respect to an application by the Council to borrow £7000 for gas-works improvements. They wanted to be able to proceed with the work during the summer months, and had asked that £700 expended on sulphate of ammonia plant should be included in the borrowing powers. The Town Clerk explained that this amount was included in the borowing powers because of the serious loss incurred by the Council on their coal contracts. The deficit on the gas revenue account was £2500 last year; and on suspense account £1000.

Rochdale Water-Works Finances.—At a recent meeting of the Water Committee of the Rochdale Corporation, the Manager of the Water Department (Mr. W. Tomlinson) reported that the past year had been a very satisfactory one. There had been an increase of 563 in the number of consumers for domestic and trade purposes. The water rentals for domestic purposes showed an increase of £776 14s. 10d.; and there was a gain of £690 7s. 10d. in the revenue from water used in trade—showing a total increase of £1467 2s. 8d. On the old works there was a profit last year of £171 8s. 5½d.; in the previous year there was a deficiency of £1781 12s. 3d. In 1886 the loss amounted to £16,653 14s. 6½d. The announcement of the profit gave the greatest satisfaction to the Committee. In regard to the Todmorden works, Mr. Tomlinson reported that the receipts from water supplied for domestic purposes showed an increase of £65 15s. 6½d.; but there was a reduction of £92 11s. 4d. in the income from trade supplies, due to the heavy rainfall—many manufacturers being able to dispense with Corporation water. The deficiency on the Ramsden Clough works account is £5028 16s. 2½d. Deducting the profit of £171 8s. 5½d. on the old works, there is a net loss of £4857 7s. 9d., which is £1083 7s. 2d. less than that for the previous year. A large part of the loss on the Todmorden works is due to the fact that the cost of obtaining the Water-Works Act of 1897 has to be repaid at the rate of no less than £1880 per annum.

Scunthorpe was again in darkness last Tuesday night, owing to the gasholder becoming "jammed" at the sides.

Mr. Thomas Duncan has succeeded to the gas coal business so long carried on by the late Mr. James Walker at No. 115, St. Vincent Street, Glasgow.

The Gas Committee of the Smethwick Town Council have handed over £2000 to the district rate fund, being the contribution from profit promised for the year ended March 31.

According to a circular lately issued by the Allgemeine Elektricitäts Gesellschaft, the Company intend shortly to place on the English market Nernst lamps of 100 and 200 watt power.

Messrs. Blake, Barclay, and Co., of Greenock, have obtained the contract for the coal elevating and conveying plant required at the power station of the Edinburgh Corporation Tramways.

SAWER & PURVES.

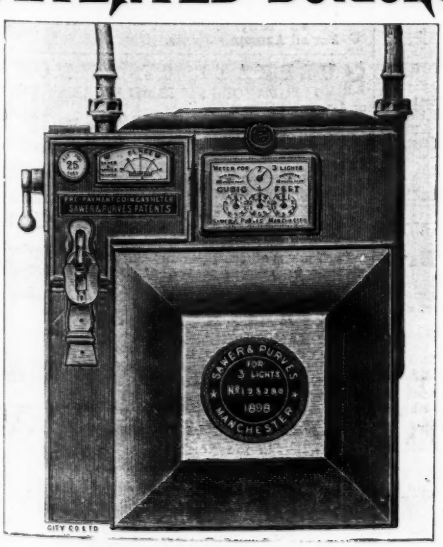
(BRANCH OF METERS LIMITED),

Telegraphic Address: "SAWER, MANCHESTER."
National Telephone: 3289 MANCHESTER.

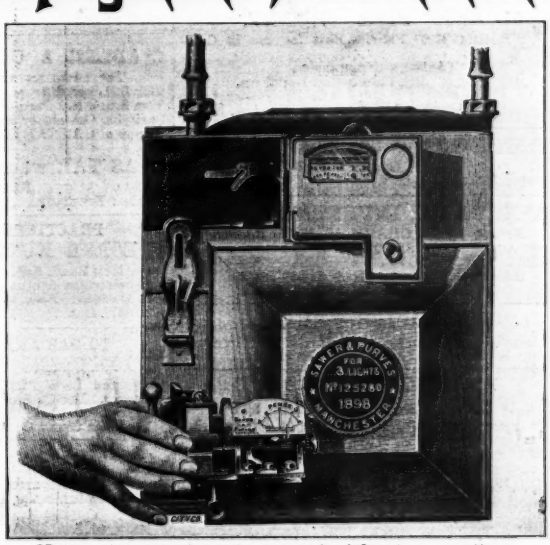
NELSON METER WORKS, MILES PLATTING,
MANCHESTER.

Makers of Meters fitted with

PATENTED Detachable Prepayment Attachment.



Meter in working position.



Meter with attachment removed without uncoupling.

The Retford Town Council have accepted the tender of Messrs. R. & J. Dempster, Limited, for a telescopic gasholder of 200,000 cubic feet capacity—more than doubling the present storage at the works.

The shareholders of the Mid-Kent Water Company have authorized the Directors to create and issue 2000 7 per cent. additional ordinary shares of £10 each. The money is required for extensive works in the districts of Ash, Fawkham, Longfield, Hartley, and Kingsdown.

The Gas Committee of the Leeds Corporation have accepted tenders for cast-iron pipes for the ensuing year at prices from 25 to 30 per cent. less than those paid twelve months ago. The same reduction applies to retort-castings. Last year the amount paid for pipes alone amounted, it is said, to £18,000.

Mr. W. R. Clay, of Kearsley, has applied for leave to amend the specification of his patent (No. 27,416 of 1898) for "Improvements in, or appertaining to, incandescent gas-burners." Particulars of the proposed amendments are set forth in the issue of the Illustrated Official Journal of Patents for the 24th inst.

Messrs. Arden Hill and Co., of Birmingham (who recently joined John Wright and the Eagle Range, Limited), have just independently started a series of exhibitions of their gas appliances, with lectures and cookery demonstrations. The first were held in Liverpool and its suburbs; and it is intended to visit Manchester, Shrewsbury, Wolverhampton, and York.

Aldgate Pump, which was for many years an important source of water supply for the City of London, is about to be removed. Referring to the old pump (the existing one is modern), Stow describes it as being at the western extremity of Aldgate Ward, where there was "a fair well where now a pump is placed." The water was celebrated in mediæval times; but, being found impure on analysis, its use was prevented by the closing of the well.

At the Building Trades Exhibition at the Agricultural Hall, which closed last Saturday, the British Uralite Company, Limited, showed for the first time in England the material named in the title. It is composed of asbestos fibre and mineral substances, which, by a novel process of manufacture, are converted into a fireproof and non-conducting material suitable for building and other work. Its use for constructional purposes was demonstrated.

A preliminary Syndicate is being formed to carry out what is described as "a unique British water supply undertaking, capable of enormous extension, now greatly wanted, and from which a 20 per cent. dividend can be expected from the beginning, and showing further profits on future development." The announcement is being made by the New Water Supply Association.

Mr. C. E. Ryder Terry and Mr. G. H. Walker, who till recently were connected with the John Wright and Eagle Range, Limited, as Secretary and Works Manager respectively, have acquired the business of Messrs. Radclyffe and Co., of the Old Town Foundry, Leamington Spa, which they will carry on under the title of the Imperial Stove Company. The works are being thoroughly reorganized for the manufacture of gas-cookers, gas-fires, and gas and steam cooking apparatus.

The first letters of allotment and regret for the new issue of preference and ordinary capital in the Richmond Gas Stove and Meter Company, to complete the amalgamation of Messrs. George Glover and Co.'s business, were posted on Saturday, and the remainder early this week. The applications were more than double the shares allotted; and a large number were received from the staff. In view of this, the Directors are issuing a further limited quantity to the latter. This is an unexpected and welcome outcome of the profit-sharing system, whereby the employees, having participated in the profits in the shape of preference shares, are now anxious to invest their own money in the ordinary shares of the Company at a small premium. Such a proof of the confidence of the employees must be gratifying to the Directors.

Messrs. Clapham Bros., Limited, of Keighley, have entered into the following contracts: With the Leigh Corporation, for six purifiers, each 30 feet square, of the Green type, complete with 24 "New Century" covers and Clapham's patent "Eclipse" joint and holding-down apparatus, and also for the structure, with roof, travelling crane, valves, and connections, and one of Clapham's patent "Eclipse" condensers; with the Edinburgh and Leith Gas Commissioners, for the supply of two of the largest of Clapham's "Eclipse" condensers for their new works at Granton; and with the Margate Gas Company, for a 2 million "Eclipse" condenser. They are also supplying Laycock and Clapham's patent "Eclipse" washer scrubbers to Armagh, Portadown, Barnsley, and South Shields, and also for the testing-plant of the Manchester Corporation; and they have secured the contract for an installation of retort-fittings for the Salford Corporation.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

TERMS OF SUBSCRIPTION to the "JOURNAL."

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance. If credit is taken, the charge is 25s. a year.

Telegraphic Address: "GASKING, LONDON."
Telephone Number: Holborn 121.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS.
Correspondence invited.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PRACTICAL RETORT SETTERS.

GEORGE NUTTALL & CO., 32, Have- lock Road, Saltley, Birmingham.
Regenerator or other Furnaces erected to Engineers' own Designs. Best Work Guaranteed. Please write for Estimates.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS CYCLES at Reasonable and LOW PRICES. Guaranteed and sent on approval. For Cash or Gradual Payments. Catalogue post free. Old Machines Exchanged or Repaired.
MELROSE CYCLE COMPANY, COVENTRY.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

OXIDE OF IRON OF FINEST QUALITY.

BALE'S Special Fire Cement should be used to keep Retorts, Furnaces, &c., in good repair during the heavy Winter Work.
Send for full Particulars to
BALE & CO., 120 & 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."
Telephone "277 HOLBORN."

NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., Central Plumbing Works, Victoria Square, BOLTON.

WANTED, a Water Main and Service LAYER (Handy Fitter preferred).
Particulars of Qualifications, Experience, and Testimonials to be sent to the SECRETARY, Water-Works Offices, NEWMARKET.

EXPERIENCED Surveyor and DRAUGHTSMAN required for large Provincial Water Company. Must be well up in Theodolite Work.
Applications, stating Age, Experience, and Salary required, to No. 3677, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Engineer of a Medium-sized Gas- Works in the North of England (now being remodelled) is prepared to take a PUPIL. Premium required. Capital opportunity for intelligent Youth
Apply, by letter, to No. 3683, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager's Clerk in a large Gas-Works. Shorthand and Typewriting necessary. Commencing Wages 25s. per week.
Apply, by letter, to No. 3667, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas Stoker for small Gas- Works. Wages 28s. Six Months, and 30s. Six Months.
Apply, by letter, with References, to the MANAGER, Gas-Works, Fazeley, STAFFS.

WANTED, a competent Gas-Fitter, used to Incandescent and Prepayment Fittings, Meters, and Stoves.
Apply, by letter, with References, to the MANAGER, Gas-Works, KING'S LYNN.

MECHANIC and Blacksmith wanted, willing to make himself generally useful on the Works.
State previous Employment, Age, Wages required, and enclosing *copies* of Testimonials, to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

WANTED, by the Brynmawr and Blaina Gas Company, a GAS-FITTER. One who has had a Gas-Works training, and capable of fixing Gas Meters and Stoves and collecting Slot-Meter Cash. Good Wages and progressive job to a suitable Man.
Send *copies* of Testimonials, and state Age and if Married, to T. ACLAND, Gas Offices, Blaina, MON.

WANTED, for a large Gas-Works in the Midlands, a thoroughly competent GENERAL FOREMAN. A knowledge of Gas Manufacture not essential: but must be a good Mechanic, and accustomed to Machinery and the Management of Men.
Address, in own handwriting, stating Age, present Occupation, Qualifications, and Salary required, and enclosing *copies* of recent Testimonials, to No. 3682, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CONSULTING GAS ENGINEER.

WANTED, a qualified Gentleman to inquire into and examine the Clonmel Gas-Works, and to report thereon to the Gas Committee of the Clonmel Corporation.
Applications, stating Terms and Qualifications, to be sent to PATRICK NUGENT, Esq. (Chairman of the Committee), 71, O'Connell Street, Clonmel, by the 7th of May, 1901, who will supply all Information upon application.

THE Shirebrook and District Gas Com- pany, whose Works are about to be erected, require a WORKING MANAGER. He must be a good Carbonizer, used to Regenerator Settings, Main and Service laying, Gas-Fitting, and the general routine of a Gas-Works. One Competent to superintend the erection of new Works preferred. Estimated annual make, 15 millions.
Apply, by letter only, with not more than three recent Testimonials, stating Age, Experience, and Salary required, to A. R. LEIVERS, Secretary, Bentinck Buildings, NOTTINGHAM.

COLCHESTER CORPORATION WATER-WORKS.

WANTED, a thoroughly efficient PLUMBER, capable of laying Water-Mains and Lead Service-Pipes. Preference will be given to one who has had experience with Kennedy's Meters, and knowledge of Water-Works Fittings. Wages £2 per week.
Applications, marked "Plumber," stating Age, previous Experience, where last employed, &c., to be sent to me, the undersigned, not later than Friday, the 10th of May, 1901, together with not more than three original Testimonials of recent date.
CHAS. E. BLAND, Superintendent.
Offices, 35, Crouch Street, Colchester.

WANTED, a Gas-Works on Lease or Purchase, by thoroughly practical Gas Engineer. Address No. 3665, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Second-hand Square Station METER in good order (30,000 cubic feet per hour); also Four 12-feet square PURIFIERS.
Address DUXBURY, 16, Deansgate, MANCHESTER.

WANTED, a Second-Hand Cast Iron TOWER SCRUBBER, about 38 feet high by 6 feet diameter, with Planed Joints, 12-inch Connections, Valves and Bye-Pass, and Spiral Staircase.
State full Particulars, Price, &c., to No. 3681, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE - One 5000-Cubic Feet per hour STATION METER, in good condition.
Apply to the MANAGER, Gas-Works, Tipton, STAFFS.

TO BE SOLD—
SINGLE GASHOLDER, 30 ft. by 10 ft. Five Columns.
SINGLE GASHOLDER, 22 ft. by 10. ft. Four Columns.
SIX DONKEY PUMPS, various sizes to 20-horse power.
Write J. WRIGHT, Bridge House, BLACKFRIARS, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY Gas Engineer, Thornhill, DEWSBURY.

WIDNES GAS-WORKS.

FOR SALE—Seven Sets of Second-hand ⌂ shape RETORT MOUTHPIECES, 15 in. by 18 in., for Settings of Sixes, with Self-Sealing Lids. West's make. Will be put into thorough working order before being sold.
Apply to the MANAGER.

FOR SALE, Cheap—One, Two, or Three PURIFIERS, 8 ft. square by 4 feet deep, in good condition, with Valves, Connections, and Lifting Gear.
INQUIRIES for all kinds of SECOND-HAND GAS PLANT will also be esteemed by SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

TENDERS FOR GAS COAL.

THE Brentwood Gas, Coke, and Light Company, Limited, are prepared to receive TENDERS for the supply of 4500 Tons of good, clean, fresh-worked GAS COAL, screened and unscreened, for the Year ending April 30, 1902.
Deliveries to be free to Brentwood Station (G.E.R.), in quantities to be subsequently determined.
Not less than 2000 Tons of any one description of Coal will be taken.
No Form of Tender issued.
Tenders to be delivered to the undersigned on or before Monday, May 6 next.
The lowest or any Tender not necessarily accepted.
C. A. FIELDER, Secretary.
Brentwood, Essex,
April 19, 1901.

TENDERS FOR CAST-IRON PIPES.

THE Brentwood Gas, Coke, and Light Company, Limited, are prepared to receive TENDERS for the supply of 165 Yards of 12-inch and 1000 Yards of 10-inch CAST-IRON GAS-MAIN PIPES, each Pipe to be 9 feet long (Spigot and Socket).
Prices to include delivery to Brentwood Station (G.E.R.).
The Pipes supplied must be cast vertically, and prove clean, true, and flawless, free from inequalities of thickness, or any other defect rendering them liable to fracture or leakage.
Firms tendering must be prepared to give delivery by May 20 next.
No Form of Tender issued.
Tenders, stating weight per yard, to be delivered to the undersigned on or before Monday, May 6 next.
The lowest or any Tender not necessarily accepted.
C. A. FIELDER, Secretary.
Brentwood, Essex,
April 19, 1901.

WALLASEY GAS-WORKS.

TO COAL MERCHANTS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply of about 7000 Tons of CANNEL and about 18,000 Tons of GAS COAL, for their Gas-Works, delivered in railway waggons at Duke Street, Birkenhead, separately for One, Two, or Three Years, from the 30th of June next.
Specifications and any further Information may be obtained on application to the Engineer, Mr. J. H. Crowther, at his Office, Great Float, near Birkenhead.
Sealed Tenders, addressed to the undersigned, and endorsed "Tender for Cannel or Coal," as the case may be, to be delivered per post at my Office as below, not later than the morning of the 16th day of May, 1901.
The Contractor will be required to enter into a bond, with approved sureties, for the due performance of the contract.
The Council do not bind themselves to accept the lowest or any offer.
By order,
H. W. COOK, Clerk and Solicitor.
Public Offices, Egremont, Cheshire,
April 26, 1901.

WALLASEY URBAN DISTRICT COUNCIL.

CONTRACTS FOR STORES.

THE Wallasey Urban District Council are prepared to receive TENDERS to supply, for a period of Twelve Months from the 30th of June next, the following among other Articles, being the principal Stores required for their Gas, Water, and Electricity Works, viz.:—

WROUGHT-IRON STEAM TUBE.
LEAD PIPE.
CAST-IRON LAMP-COLUMNS, &c.
CHARGING SPADES.
CAST-IRON MAIN-PIPES.
VITRIOL.
SPECIAL RUBBER-TUBE CONNECTIONS.
COMMON BRICKS.
IRON AND BRASS COCKS, FERRULES, &c.
CAST-IRON STEEL BOXES.
IRON AND STEEL.
OILS.
SLUICE VALVES AND HYDRANTS.
WATER, GAS, AND ELECTRICITY METERS.
RETORTS AND FIRE-CLAY GOODS.
CABLES, JUNCTION BOXES, &c.

Further Particulars, with Forms of Tender, may be obtained, and Samples inspected, on application at the Engineer's Office, at the Works, Great Float, near Birkenhead.
Sealed Tenders, which must be on the printed form, endorsed "Tender for Stores," and addressed to the undersigned, to be delivered, per post, not later than the morning of the 16th day of May, 1901.
The successful Contractors will be required to enter into bonds, with approved sureties, for the due performance of their contract.
The Council do not bind themselves to accept the lowest or any Tenders, and reserve to themselves the right to divide any Tender.
By order,
H. W. COOK, Clerk and Solicitor.
Public Offices, Egremont, Cheshire,
April 26, 1901.

LUDLOW UNION GAS COMPANY.

THE Directors are prepared to receive TENDERS for the supply of from 2000 to 2300 Tons of best screened GAS COAL from June 30, 1901, to June 30, 1902; the Coal to be fresh wrought and free from Bats, Bind, and other Foreign Matter.
The Coal is to be delivered in monthly quantities as directed by the Manager.
All Tenders to be sent in to the undersigned not later than the 20th of May, 1901.
The Directors do not bind themselves to accept the lowest or any Tender.
W. H. WHITEHOUSE, Manager.

SEVENOAKS GAS COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the Sevenoaks Gas Company invite TENDERS for the supply of 8000, or not less than 1000, Tons of GAS COAL (Durham or Yorkshire preferred) during Twelve Months ending May 31, 1902, delivered at the Company's Siding, Bat and Ball Station, S.E. & C. Railway, Sevenoaks, Kent.
Tenders to be sent in by not later than Tuesday, May 7, 1901, addressed to the Chairman, W. H. Cronk, Esq., 88, High Street, Sevenoaks.
Further Particulars, if required, may be had of
HENRY HOW, Secretary.
Gas Office, Sevenoaks,
April 26, 1901.

CORPORATION OF STAFFORD.

THE Gas and Electricity Committee of the above Corporation invite TENDERS for the surplus TAR to be produced at their Works over the period of Twelve Months, commencing the 1st of June, 1901.
Quantity of Coal Carbonized, about 14,000 Tons.
Sealed Tenders, endorsed "Tar," to be addressed to the Chairman, Gas and Electricity Committee, Gas Offices, Chell Road, Stafford, and to be delivered on or before Thursday, the 9th of May, 1901.
The Committee do not bind themselves to accept the highest or any Tender.
Any further Particulars may be obtained, on application, from the undersigned.
(Signed) HUBERT POOLEY, Assoc.M.Inst.C.E., Engineer and Manager.
Gas Offices, Stafford,
April 26, 1901.

CORPORATION OF ROTHERHAM.
(GAS DEPARTMENT.)

THE Gas Committee of the Rotherham Corporation are prepared to receive TENDERS for the supply, delivery, and erection of a TWO-LIFT GUIDE-FRAMED GASHOLDER.
The Committee also require an alternative Tender for a COLUMNLESS, SPIRALLY GUIDED HOLDER, with Patent Improved Spiral Plates.
The Contractors must not pay less than the Standard Rate of Wages paid in the District, and must observe the proper conditions of labour; and no sub-contracting will be allowed except by permission of the Corporation.
Plans and Specifications may be obtained upon application to the Engineer, Gas Offices, Rotherham, on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.
Tenders, endorsed "Gasholder," to be delivered to the undersigned on or before May 17, 1901.
The Corporation do not bind themselves to accept the lowest or any Tender.
H. HAMPTON COPNALL, Town Clerk.
Town Hall, Rotherham,
April 25, 1901.

LIVERPOOL UNITED GASLIGHT COMPANY

TENDERS FOR CANNEL AND COAL.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 90,000 Tons of CANNEL, and 180,000 Tons of COAL, to be delivered at the various Works of the Company during the period of Twelve Months, between the 1st of July, 1901, and the 30th of June, 1902.
Tenders will be received for the whole or any portion of the above quantity.
The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.
Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom Tenders (on the printed Form only) must be delivered, at or before Ten a.m., on Wednesday, May 15, endorsed "Tender for Cannel and Coal,"
By order,
WILLIAM KING, Engineer.
Gas Office, Duke Street,
Liverpool, April 26, 1901.

ANDOVER (HANTS) GAS AND COKE COMPANY LIMITED.

NOTICE OF SALE OF 300 £10 SHARES

In the above prosperous Undertaking, which has for the past Seven Years paid a Dividend of 10 per cent. per annum.

MESSRS. FREDERICK ELLEN & SON will SELL BY AUCTION, at the Mart, Andover, on Wednesday, the 15th of May, 1901, at Three o'clock

300 £10 SHARES
IN THE
ANDOVER GAS AND COKE COMPANY, LTD.

Part of the new issue authorized for the enlargement of the Plant and capabilities of the Works rendered necessary by the continuous increase of the Company's Business.
Further Particulars may be had of Messrs. LAMB AND SON, Solicitors, ANDOVER; or of the AUCTIONEERS.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE BY TENDER OF
£34,000 THREE-AND-A-HALF PER CENT.
DEBENTURE STOCK.

MINIMUM PRICE, £100 PER CENT.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £34,000 of THREE-AND-A HALF PER CENT. DEBENTURE STOCK, to be issued under the Provisions of the Newcastle-upon-Tyne and Gateshead Gas Act 1896.

Particulars and Forms of Tender may be obtained on application to the undersigned, and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 14th of May, 1901.

The Stock will be allotted to the highest bidders; but no Tender will be accepted at a lower price than par.

By order,
THOMAS WADDOM,
Secretary.

Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, April 12, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WEST HAM GAS COMPANY.

NEW ISSUE OF 2500 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Monday, May 13, at Two o'clock, in Lots.

Particulars of the SECRETARY of the Company, at the Offices, Union Street, STRATFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND GAS COMPANY.

NEW ISSUE OF £4200 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF £2700 FOUR PER CENT.
PERPETUAL DEBENTURE STOCK, AND
500 £10 NEW ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 14, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

PATENTS, DESIGNS, AND TRADE MARKS ACTS, 1883 TO 1888.

NOTICE is Hereby Given, that William Richard Clay, of 18, Station Road, Kearsley, in the County of Lancaster, has APPLIED FOR LEAVE TO AMEND THE SPECIFICATION OF LETTERS PATENT No. 27,416 of 1898, for "Improvements in, or appertaining to, Incandescent Gas-Burners."

Particulars of the proposed Amendment were set forth in the "Illustrated Official Journal (Patents)" issued on April 24, 1901.

Any person, or persons, may give Notice of Opposition to the Amendment (on Form G) at the Patent Office, No. 25, Southampton Buildings, London, W.C., within One Calendar Month from the date of the said "Journal."

(Signed) C. N. DALTON,
Comptroller-General.

C. F. ENNIS,
31, Haselrigge Road, Clapham, S.W.,
Registered Patent Agent.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF HALF-YEARLY MEETING.

NOTICE is Hereby Given, that the next HALF-YEARLY MEETING of the Shareholders in this Company will be held at the Company's Offices, Commercial Road, Portsmouth, on Thursday, the 23rd day of May, 1901, at Three o'clock in the afternoon, on the following business: To receive the Accounts and Balance-Sheets to the 31st of March last, and the Director ' Report; to declare Dividends; to elect Directors and Auditor in place of those retiring by rotation: Notice of Motion by G. W. Edmonds, Esq.: "That the Directors be authorized to subscribe annually, out of the funds of the Company, the sum of Ten Guineas to the Association for Nursing the Sick Poor;" and for the transaction of the other Ordinary Business of the Company.

The Register of Transfers WILL BE CLOSED on and after the 16th day of May, 1901, until after the Meeting.

By order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

Dated the 25th day of April, 1901.

CANTERBURY GAS AND WATER COMPANY.

TENDERS FOR GAS COALS.

TENDERS are invited for the supply of 14,000 Tons of the best GAS COALS, to be delivered during One Year, commencing on the 1st of June next.

Forms of Tender, containing Particulars and Conditions of the Contract, may be obtained on application to the undersigned.

Sealed Tenders, endorsed "Coals," to be delivered at the Company's Offices, Castle Street, Canterbury, on or before Saturday, the 18th of May next.

By order,
JAMES BURCH,
Secretary and General Manager.

April 22, 1901.

MORTGAGEES' SALE.

IMPORTANT TO MANUFACTURING CHEMISTS AND OTHERS.

TO BE SOLD, the Lessee's interest in the Buildings, Lands, and Premises, containing about 1¼ acres, known as LITTLE ISLAND CHEMICAL WORKS, Co. Cork, together with the Machinery, Fixtures, and Plant attached thereto.

The Premises are situate on the Shore of the River Lee, about 5 miles from the City of Cork. There is a private Wharf where Vessels can load at the very door of the Factory. The business of manufacturing Aniline Dyes, Creosote, Pitch, &c., from Coal Tar has been for some Years, and is still, carried on at these premises.

For further Information, apply to GREGG, JERMYN, AND SONS, Solicitors, CORK.

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.

The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.

Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED,
DARLINGTON.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

HARDMAN & HOLDEN, LD.

ESTABLISHED 1820.

SULPHURIC ACID.

GUARANTEED absolutely free from Arsenic and of excellent Purity. Specially prepared for Sulphate of Ammonia Manufacturers.

Works: BLACKBURN; Miles Platting and Clayton, MANCHESTER.

Head Office: Miles Platting, MANCHESTER
Inquiries Solicited.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

WELDON MUD
FOR
GAS PURIFICATION,
For use in the
RECOVERY OF SULPHUR,
ALSO
Removal of last Traces of SULPHURETTED HYDROGEN in catch position.

Full Particulars on application to the Patentees:
GAS DESULPHURIZATION CO.,
— *LIMITED,* —
1, FENCHURCH AVENUE, LONDON, E.C.

THOMAS TURTON
AND SONS, LIMITED,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:
90, CANNON STREET, E.C.

HOLMSIDE
GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . .	11,205 Cubic Feet.
Illuminating Power	16.7 Stand. Sperm. Candl.
Coke (of good & pure quality)	13¾ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

WILLEY & CO., ENGINEERS, LONDON & EXETER.

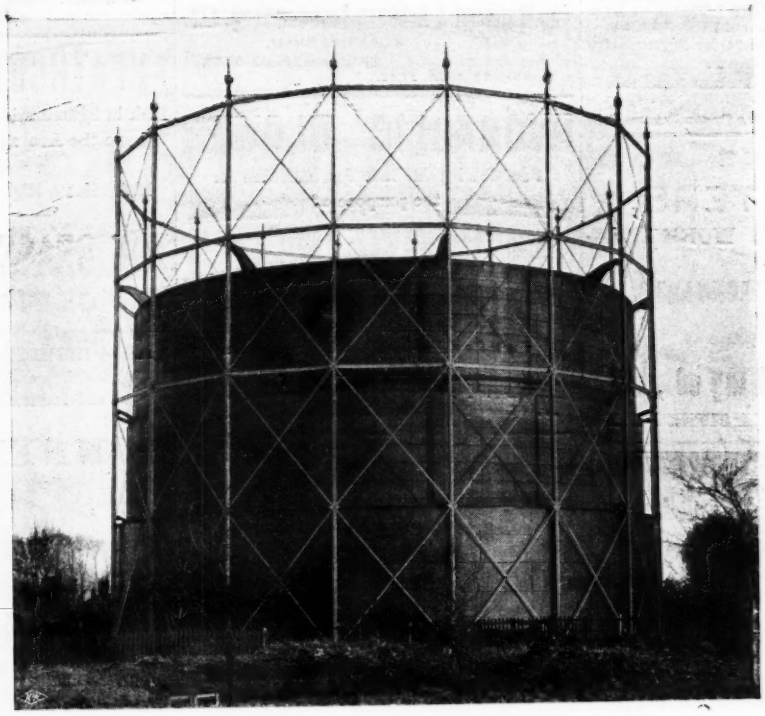
Telegrams: "WILLEY, EXETER." Telephone: 132 and 263.

GAS APPARATUS OF EVERY DESCRIPTION.

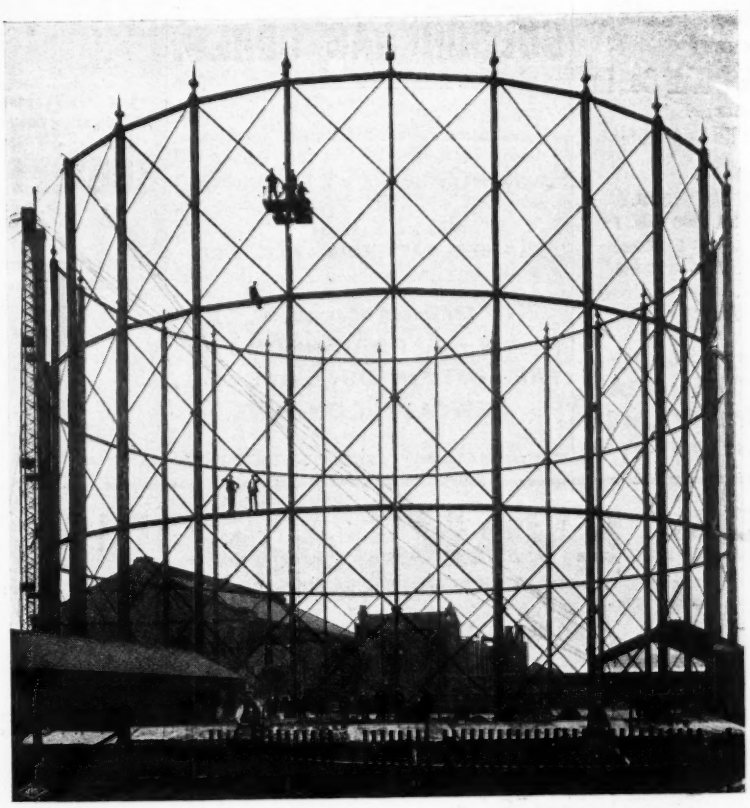
ENGINES, EXHAUSTERS, AND FITTINGS.

Makers of IMPROVED WOOD GRIDS for PURIFIERS with OAK, CANE, or IRON BOLTS.

TYSOE'S SELF-SEALING MOUTHPIECES.



hree Lift Gasholder and Steel Tank, 90 feet diameter by 14 feet deep, recently erected for the EPSOM GAS COMPANY.



Three-Lift Gasholder, 145 feet diameter by 35 feet deep, in course of construction for the WANDSWORTH & PUTNEY GAS COMPANY.

GASHOLDERS and TANKS.

RETORTS PURIFIERS, CONDENSERS, SCRUBBERS.

GAS-GOVERNORS, STATION METERS CONSUMERS' METERS, PREPAYMENT METERS.

GAS-FITTINGS.

GAS-COOKERS.

LIVESEY WASHERS, &c., &c.

Chief Offices and Works: ST. THOMAS, EXETER.

London Office: 18, ADAM STREET, ADELPHI, W.C.

TROTTER, HAINES, & CORBETT, LIMITED,

Brettell's Estate

FIRE-CLAY & BRICK WORKS, STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 84, OLD BROAD STREET, E.C.

ALL PARTS FOR GAS-METERS,

INDICES, CRANKS, WORMS, &c.

PREPAYMENT ATTACHMENTS.

Supplied by the

Tourtel Manufacturing Co., Ltd.,

146A, QUEEN VICTORIA STREET, E.C.

CRESSWELLS' ASBESTOS CO., LTD.

WELLINGTON MILLS BRADFORD, YORKS.

Asbestos Spinners and Manufacturers.

Telephone No. 950. Tels.: "ASBESTOS, BRADFORD."

If you want a first-class NON-CONDUCTING COVERING for STEAM BOILERS, PIPES, CYLINDERS, CISTERNS, or other heated surfaces, drop a line to us. Plastic and Removable Sorts. Ask for No. 4 Catalogue.

Applications for Colonial and Foreign Agencies desired.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500 Cub. Ft.
Illuminating Power	16·9 Candles.
Coke (of good quality)	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE STEEL, COAL, & COKE COMPANY, Ltd.,

QUAYSIDE, NEWCASTLE-ON-TYNE.

HEBBURN MAIN GAS COALS.

Yield of Gas per Ton	10,500 Cubic Feet.
Illuminating Power	16·4 Candles.
Coke	68 per Cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to

The Wallsend & Hebburn Coal Company, Ltd.

8 Lombard Street, NEWCASTLE-ON-TYNE.

W. RICHARDSON, Fitter.

HYDRAULIC BLOWER

For blowing Air into Gas Purifiers for the purpose of

REVIVIFYING THE FOULED OXIDE.

Full Particulars on application.

LUXWERKE LUDWIGSHAFEN AM RHEIN.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

BOLDON GAS COALS.

Yield of Gas per Ton	10,500 Cubic Feet.
Illuminating Power	16·9 Candles.
Coke	66·7 Coke.
Sulphur	0·86 Sulphur.
Ash	2·04 Ash.

As per Analysis by

Mr. JOHN PATTINSON, F.I.C., F.C.S.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

THOMAS DUXBURY & CO.,

16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER." Telephone 1806.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., Ld.,

CHESTERFIELD.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE

BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·89 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE, SON, & HUNTER,

COAL OWNERS, NEWCASTLE-ON-TYNE

OR

E. FOSTER & CO.,

21, JOHN STREET, ADELPHI, LONDON, W.C.

JOSEPH EVANS & SONS, CULWELL WORKS, WOLVERHAMPTON.

Telegrams: "EVANS, WOLVERHAMPTON."

PLEASE APPLY FOR CATALOGUE No. 8.

National Telephone No. 7089.

12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

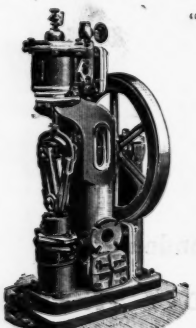


Fig. 702. "SINGLE RAM" STEAM-PUMP.

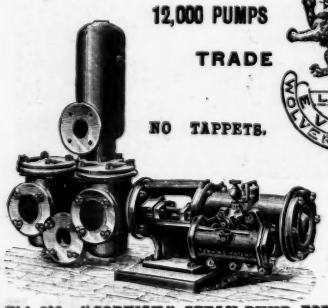


Fig. 808. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

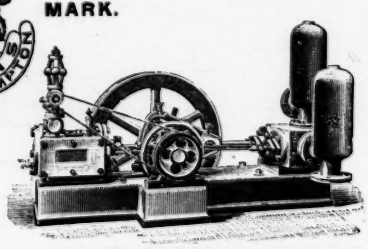


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

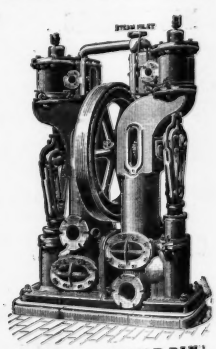


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

INCLINED RETORTS.

HORIZONTAL RETORTS.

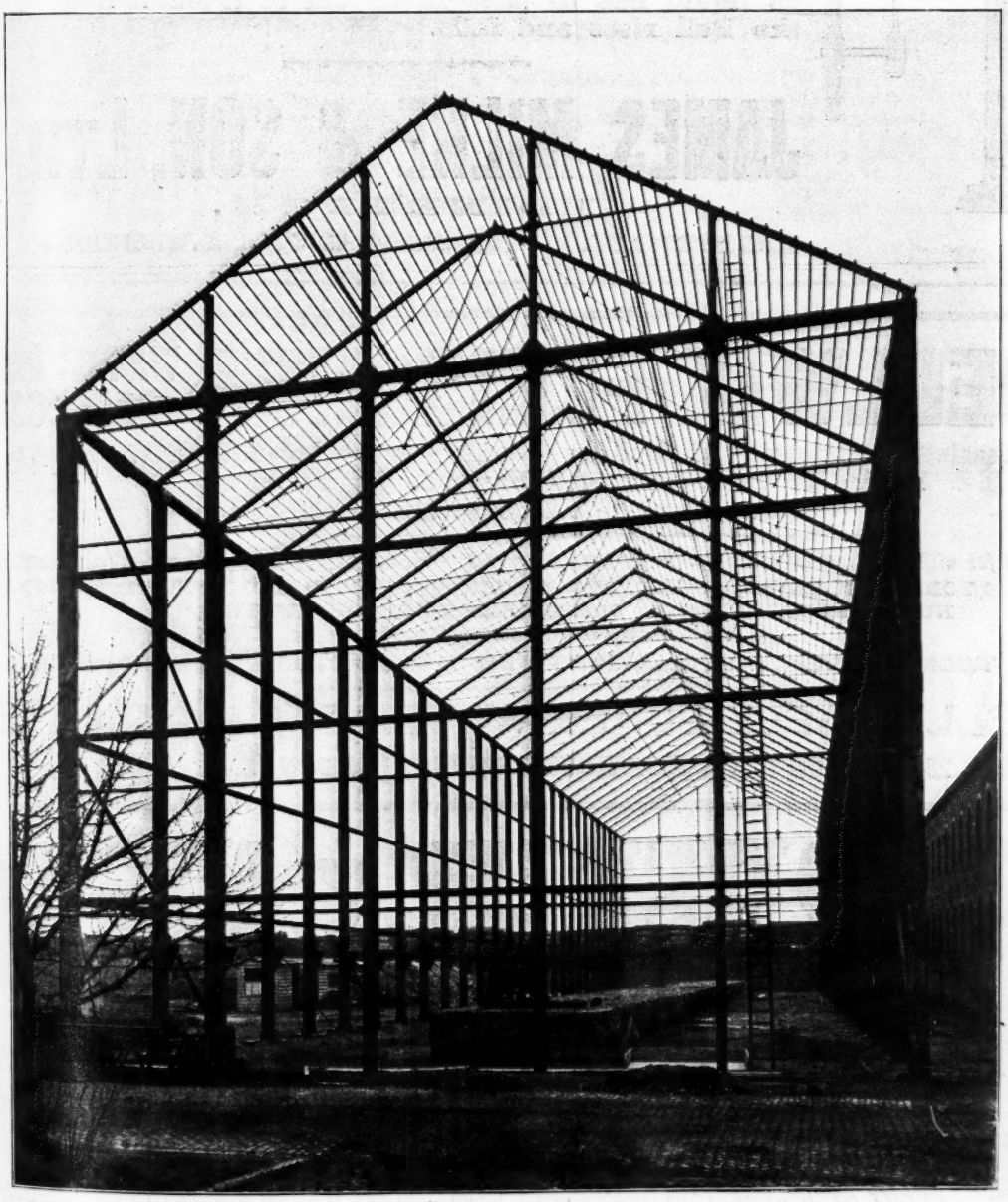
RETORT BENCHES AND SETTINGS,

WITH

GENERATOR OR REGENERATOR FURNACES.

W. J. JENKINS & CO., Ltd., RETFORD.

S. CUTLER & SONS, MILLWALL, LONDON.

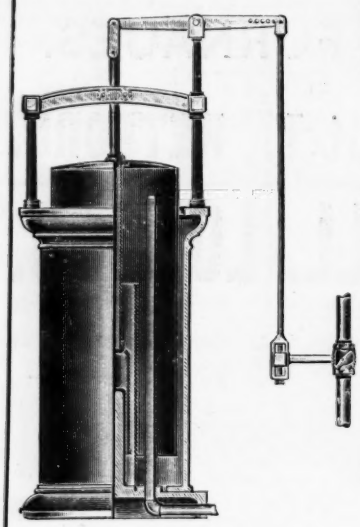


EVERY KIND OF PLANT FOR GAS AND WATER WORKS. ROOFS GIRDERS, TANKS, STEEL-FRAMED BUILDINGS.

STEEL RETORT-HOUSE RECENTLY ERECTED BY MESSRS. CUTLER.

GASHOLDERS. CARBURETTED WATER-GAS PLANT. OIL-TANKS.

HARRIS & PEARSON,
STOURBRIDGE, ENGLAND.
MANUFACTURERS OF
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.
GLAZED BRICKS AND PORCELAIN BATHS.



Hydraulic Steam-Regulator
PATENT

for Controlling the supply of Steam to the Engine driving Exhauster according to the make of Gas.

The peculiar construction makes it impossible for the Regulator to work other than gradually, as liquid has to pass in or out of a small hole as the Bell rises and falls.

JAMES MILNE & SON, LTD.
EDINBURGH.
LONDON. GLASGOW. LEEDS.

THE DELLWIK-FLEISCHER WATER-GAS PROCESS

For Increasing the Capacity of Coal-Gas Works, also for Incandescent Lighting, Driving of Gas-Engines, and Manufacturing Purposes.
(PATENTS IN ALL COUNTRIES)

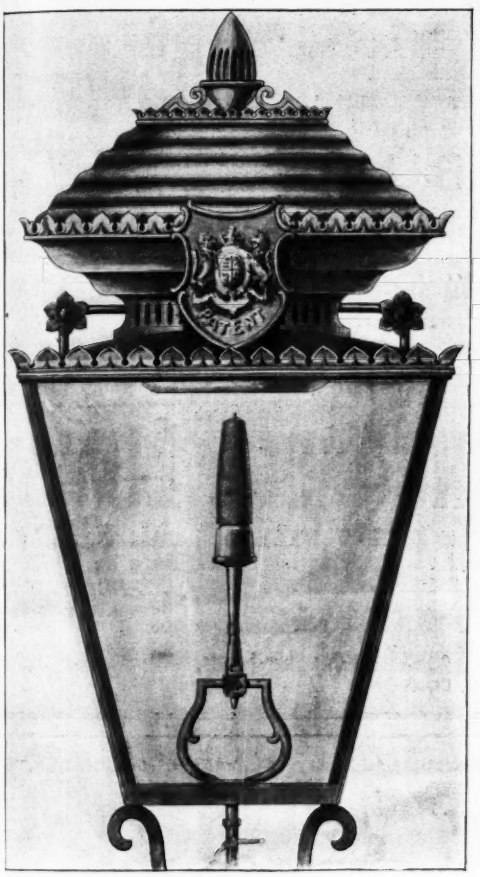
Plants contracted for within the last Eighteen Months for the following Gas-Works: WEST BROMWICH, KÖNIGSBERG, ISERLOHN, LYONS, ERFURT, REMSCHEID, PFORTSHEIM, PLAUEN, BARMEN-RITTERSHAUSEN, NUREMBERG, BRUMMEN,* OSTERFELD,* WARSTEIN,* WIBORG.*
[* Blue Water Gas with Incandescent Burners.]

ALSO TWENTY-SEVEN INSTALLATIONS FOR MANUFACTURING PURPOSES.

THE DELLWIK-FLEISCHER WATER-GAS SYNDICATE,
25, VICTORIA STREET, WESTMINSTER, LONDON, S.W.

MOBBERLEY & PERRY
STOURBRIDGE.
Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
London Agents: Contractors for the erection of Retort-Benches complete.
BALE & HARDY, Gas Engineers and Contractors,
BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

SCOTT-SNELL
SELF-INTENSIFYING LAMP.



SIZE NORMAL.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

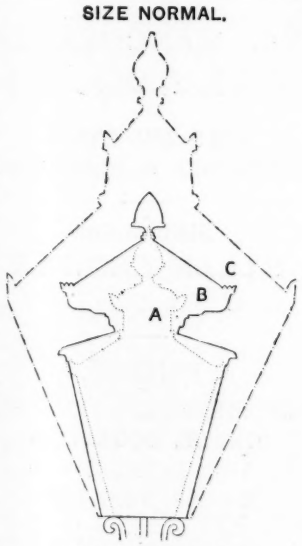
INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from **4 inches to 36 inches of Water; 8 inches to 10 inches is usually preferred.**

400-*CANDLE POWER OBTAINED FROM A SINGLE BURNER.*

Lanterns supplied with Single, Duplex, or Cluster of Burners.



SCALE DIAGRAM.
A. Ordinary 16 inch Street Lamp.
B. Scott-Snell Self-Intensifying Lamp.
C. Ordinary Refuge Lamp.

HIGH-PRESSURE LIGHTING HAS COME TO STAY.

Orders for Trial Lamps will, as far as possible, be executed in rotation.

The Lamps are being made by Automatic Machinery, similar parts interchangeable, minimum of hand labour.

THE LAMPS MAY BE INSPECTED AT ANY TIME BY APPOINTMENT.

THE SCOTT-SNELL SELF-INTENSIFYING GAS-LAMP COMPANY, LTD.,

Telephone No. 559 Westminster.
Works: 29, GILLINGHAM STREET, S.W.

53, Victoria Street,
WESTMINSTER, S.W.

ESTABLISHED 1873.

Contractors to H.M. Government.

RETORT-SETTINGS

INCLINED, REGENERATIVE, GENERATIVE, AND FLOOR LINE.

SEVERAL THOUSANDS OF OUR SETTINGS IN SUCCESSFUL WORK.

Plans, Estimates, and full Particulars for Complete or Partial Erection and Renewal.

J. & H. ROBUS,

Engineering Contractors for Gas and Water Works,

20, BUCKLERSBURY, LONDON, E.C.,

And GORING, OXFORDSHIRE.

GASHOLDER TANKS. RESERVOIRS.

MAIN LAYING. BORING. WELL SINKING.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.
Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.
Telegraphic Address: "PARKER, LONDON."

Telephone No. 103. Telegraphic Address: "ELEVATOR, HASLINGDEN."

S. S. STOTT & CO.,

ENGINEERS, HASLINGDEN, NR. MANCHESTER.

COAL AND COKE ELEVATORS & CONVEYORS.

COAL AND COKE STORAGE PLANTS.

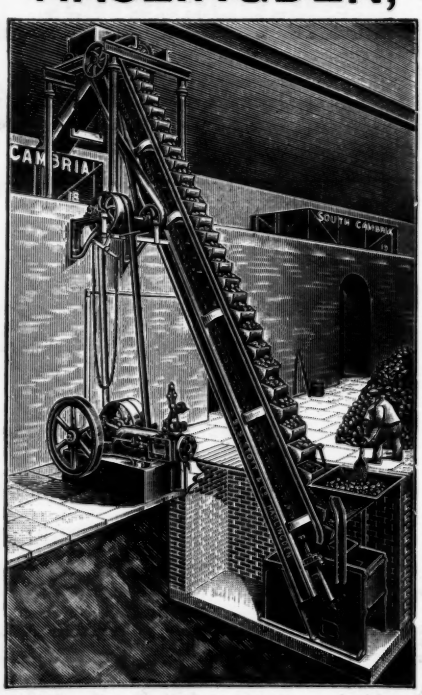
COAL AND COKE BREAKERS.

WHARF ELEVATORS FOR UNLOADING BARGES.

ELEVATORS & CONVEYORS for BOILER-HOUSES.

STAMPED AND RIVETED STEEL ELEVATOR BUCKETS.

DETACHABLE CHAINS AND SPROCKET WHEELS.



Coke Elevator Loading Railway Waggons.

LIME AND OXIDE ELEVATORS & CONVEYORS.

HIGH-CLASS STEAM-ENGINES up to 1000-Horse Power.

PUMPS, HORIZONTAL AND VERTICAL, SINGLE, DOUBLE, or THREE-THROW, for WATER-WORKS, &c.

BEAM PUMPING-ENGINES.

AIR-COMPRESSORS.

BELT PULLEYS, ROPE PULLEYS, GEARING, &c., &c.

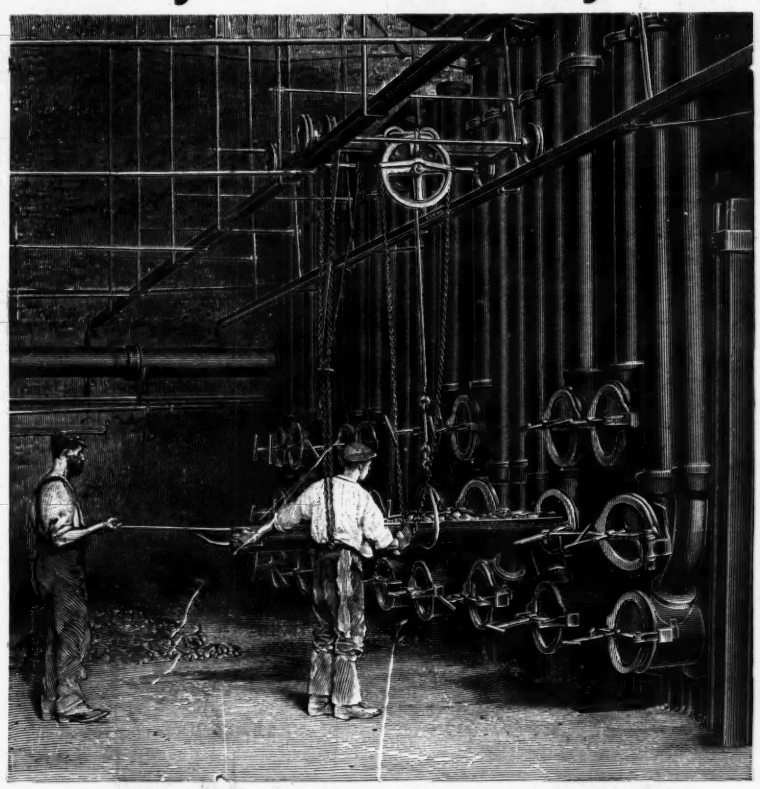
BIGGS, WALL, & CO.

THE "RAPID" MANUAL CHARGING APPARATUS.

REPEAT ORDERS FOR MACHINES

At the following Places:
Two Machines NEWPORT (Mon.)
Two Machines WORTHING.

MACHINES IN COURSE OF ERECTION:
Two Machines WREXHAM.
Four Machines ALDERSHOT.
One Machine AUSTRALIA.



4 CWT. CHARGE TAKES LESS THAN ONE MINUTE.

Telegraphic Address: 'Ragout, London.'

13, CROSS ST., FINSBURY, LONDON, E.C.

THIS MACHINE CAN BE SEEN AT WORTHING, YEOVIL, AND NEWPORT (MON.) GAS-WORKS.

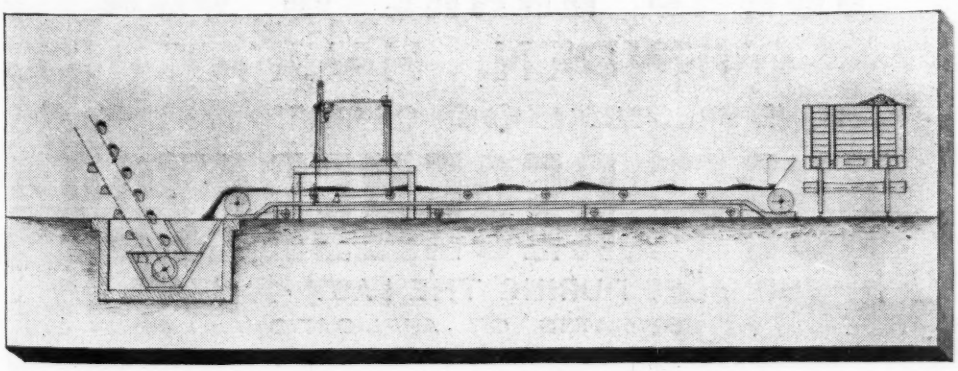
CONTINUOUS COAL WEIGHING & RECORDING.

THE ONLY CONVEYOR WEIGHING-MACHINE IN THE MARKET.

In conjunction with Messrs. Sam. Denison & Son, Weighing-Machine Makers, of Leeds, we have successfully designed a Machine for Weighing Coal, Ores, and other Materials in bulk, while passing on a Conveyor. The Machine weighs accurately, requires no attention, and automatically records the Weights passed over.

Telegrams: "FILTER, GREENOCK."

Branch Office 110, CANNON ST. LONDON.



Codes: A.1. A.B.C.

Head Office: GREENOCK.

THE BLAKE-DENISON CONTINUOUS WEIGHER.

BLAKE, BARCLAY, & CO., VICTORIA WORKS, GREENOCK.

WILSON CARTER & PEARSON,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

THE THAMES BANK IRON CO.

UPPER GROUND STREET, LONDON, S.E.,

SUPPLY FROM STOCK

CAST-IRON RETORTS

AND ALL KINDS OF GAS-WORKS APPARATUS,

SOCKET-PIPES FOR GAS OR WATER PURPOSES.

FLANGE PIPES FOR STEAM.

Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS

AGENTS FOR

ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

ARROL-FOULIS

Patent Automatic Machinery

FOR

DRAWING AND CHARGING GAS-RETORTS.

Full Particulars may be obtained from the Sole Makers,

SIR WILLIAM ARROL & CO., Limited,

GLASGOW.

[See Illustrated Advertisement, April 2, p. 916.]

BARRY, HENRY, & CO.,

— *LIMITED.* —

Specialities:

TRANSMISSION

OF

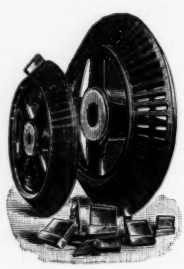
POWER.

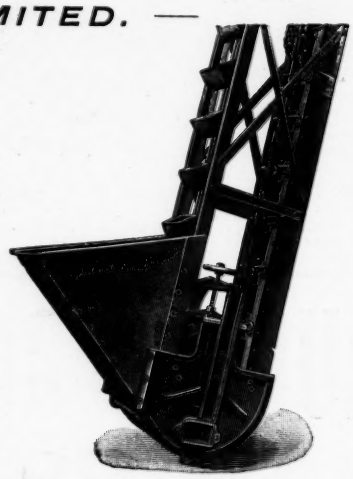
Rope and Belt Pulleys,
Spur and Bevel Wheels
Shafting and Couplings,
Pedestals, and Fixings.

WORKS:

ABERDEEN,

SCOTLAND.





Specialities:

TRANSMISSION

OF

MATERIALS.

Conveyors,
Elevators,
Grinding Machinery,
Motors.

AND

64, MARK LANE,

LONDON, E.C.

JONAS DRAKE & SON,

OVENDEN, HALIFAX,

HAVE ERECTED **500** OF THEIR PATENT

TUBE REGENERATOR

FURNACES DURING THE LAST **4** YEARS.

ESTIMATES ON APPLICATION.

Telephone No. 43. HALIFAX EXCHANGE. | LONDON OFFICE: **34, VICTORIA ST., S.W.** | Telegraphic Address: "DRAKESON HALIFAX."

HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.
Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

Manufacturers of Glasshouse Pots and Crucibles of every kind.
Established 1836.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N.
GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

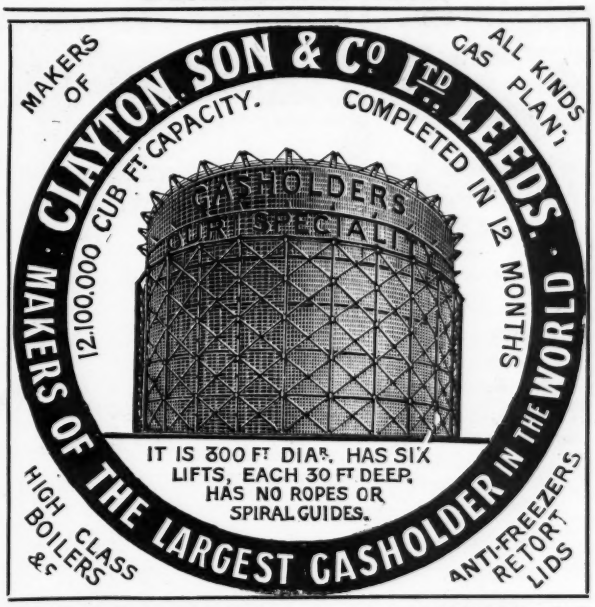
MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.
Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
Established 1866.


MAKERS OF
CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
A SPECIALITY
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

London Office: 60, QUEEN VICTORIA STREET, E.C.
Telegraphic Addresses: "*GAS, LEEDS.*" "*ECLARAGE, LONDON.*"

R. & J. DEMPSTER, LD., MANCHESTER.

Telegraphic Address:
"SCRUBBER, MANCHESTER."
National Telephone:
Nos. 54 and 2296.

IMPROVED
Water-Cooled Condensers

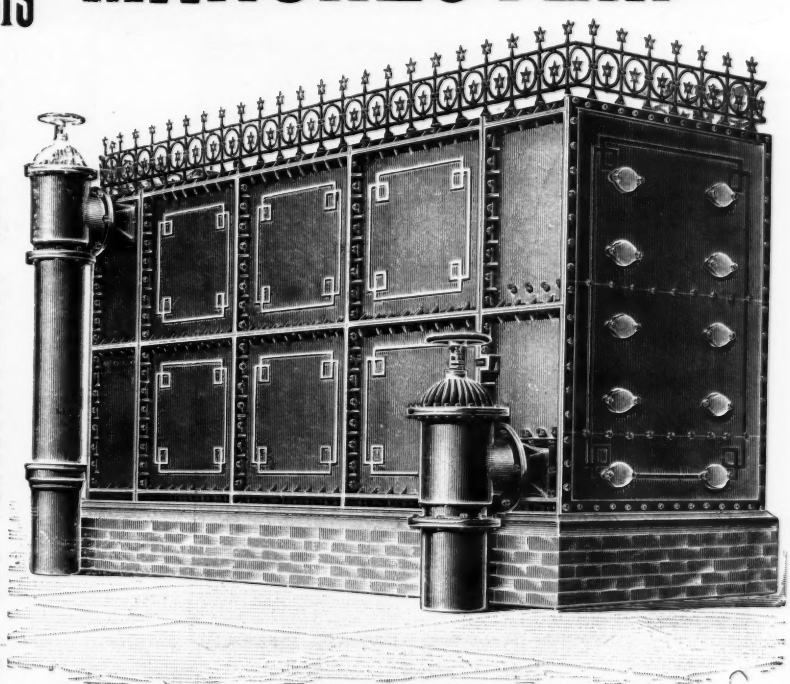
This water-cooled Gas Condenser is designed to work against the great variations of temperature between day and night, sunshine and shade, summer and winter, which are found in this and other countries.

Water being the cooling medium, the temperature of the gas can be kept under control better than with air; and the gas can be sent forward to the purifying plant at the proper temperature for efficient and economical purification.

The cold water enters at the bottom, and gradually rises to the top as the water absorbs heat, thus causing the warm gas to meet the warm water first, and to leave the Condenser in contact with water at any desired temperature by simply regulating the feed-water tap. The gas is thus **cooled progressively, uniformly, and effectually.** The simple construction of this Condenser affords a large cubical capacity, so that the gas remains in a considerable time, and secures all the advantage due to slow-speed condensation. Every part of the Condenser is easily accessible, and by removing the end plates the whole of the interior can be got at. It can be erected under cover, and protected from extremes of heat or cold.

R. & J. DEMPSTER, LTD., recommend this Condenser to be used as a Finishing Condenser, after the gas has already passed through the ordinary Annular or Air Condensers.

Condensers of this type equal to 10,500,000 cubic feet per 24 hours already erected and at work.



From a Photograph of Condenser erected at the Gas-Works, Widnes.
Capacity 1,500,000 cubic feet per 24 hours.

PARKINSON AND W. & B. COWAN, LTD.

(PARKINSON BRANCH.)

PATENT

Equilibrium Governors.

A very large number are now at work; and all Engineers who have adopted them speak in unqualified terms of their great efficiency.

COUNTERBALANCE OR AIR VESSEL AS DESIRED, FITTED WITH SIX COLUMNS AND GIRDERS, WEIGHTS, OR WATER PRESSURE.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegrams: "INDEX."
Telephone No. 778 King's Cross.

BELL BARN ROAD WORKS,
BIRMINGHAM.
Telegrams: "GASMETERS."
Telephone No. 11[illegible].
[See also Advt., p. 1104.

LONDON: Printed by WALTER KING (at the Office of King, Sell, and Olding, Ltd., 12, Gough Square); and published by him at 11, Bolt Court Fleet Street, in the City of London.—Tuesday, April 30, 1901.